GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

Paisley's Trial.

WE would join in the expressions of sympathy that have been showered upon the stricken town of Paisley. It would be hard to picture anything more pathetic than the accounts which came from this industrial centre of Scotland on New Year's Eve of a panic during a performance for children at a local cinema. Bitter experience tells one what to expect in a crowded audience, sitting practically in darkness, when there is suddenly raised a cry of "Fire," and smoke in volume is seen to be entering the place; and in the Paisley case this audience was composed of children. Of recent years there have been improvements in the facilities for rapidly emptying places of public assembly, and in enforced precautions against fire. In both respects, the best is needed; for in the wake of panic follow dire results. At Paisley, seventy young lives were lost, and many children are still in hospital; an appalling issue from so small a cause as here existed.

Subsequent proceedings may throw further light upon certain aspects of the affair which must for the time being remain in doubt; but early accounts seem to show that a smouldering spool was thrown towards the entrance, and that from this point smoke and fumes passed into the hall, giving rise to panic. The magnitude of the disaster was due to the whole of the 500 children present turning their backs to the entrance, and making a rush towards a closed and barred exit at the rear of the premises. The Manager promptly removed the smouldering spool to open ground outside the hall; but, alas, the damage had then been done. The stage was set for just such a tragedy as came to pass. The facts stated are sufficient to explain the sad sequence of events; but on the following day a popular evening newspaper declared, in type over a quarter-of-an-inch in depth, that there was an "Escaping Gas Theory." The only justification we were able to find for this was an announcement printed in heavy black type, to the effect that "the Chief Officer of the Fire Brigade had stated that many of the gas brackets in the cinema were broken by the children trying to climb over each other and holding on to them in the mad rush to get out."

The special correspondent at Paisley of "The Times" puts the matter in much better proportions with these remarks: "The statements of the Manager as to his "prompt throwing of the smouldering spool on to open "ground outside the hall make it difficult to believe that "gas was directly responsible for the deaths. It seems "more probable from the position of the dead that the "great majority had the breath crushed out of their "bodies."

What is a Good Cooker?

BEFORE now we have referred to the well-organized stove shops and physical laboratories of the Cardiff Gas Light and Coke Company, in which all the appliances supplied by the Company are subject to careful investigation. An account of some of the work undertaken was given by Mr. W. T. Lane in a paper—published elsewhere in this issue—before the Wales and Monmouthshire Juniors recently; and the tests which he has made on the practical utility of cookers to the housewife who knows nothing whatever about "B.Th.U. per hour," and so on, have led him to suggest some modifications of the specification laid down by the Investigation Committee of the Institution of Gas Engineers.

First, he thinks that 8 to 10 minutes should replace the 12-minute period specified by the Institution for the normal maximum consumption test; secondly, that the factor of safety test ought not to be dependent on the normal maximum consumption test for ascertaining its maximum pressure, but that the safety test should be carried out at a definite pressure (say, 100 tenths); thirdly, that the loading specified by the Institution for the suitability for cooking test is too high. The first two considerations, of course, are vitally dependent on uniform district pressure; and he would be a bold man who gave a definite figure for the average pressure in his area of supply. The ideal remedy for variations of (say) 6 tenths in one district and 2½ tenths in another, perhaps distant from the works, is the use of governors on every appliance; it would eliminate any need for a factor of safety test. Practical difficulties, primarily the matter of cost, stand in the way of the consummation of this idea, but they ought not to be allowed to screen the vision against the desirability of individual governing.

Mr. Lane's paper is indicative of the advance which has been made of late years in cooker design generally, in both oven and hotplate. The gas consumption of the new models is in happy contrast to that of the old types; and our readers will find much to interest them in the author's figures relating to bottom-flue ovens fitted with either a single burner or two burners. Another matter of lively concern is the thermal efficiency of the new ring burner compared with that of the spreading-flame pattern. Mr. Lane's figures demonstrate that the former (with a thermal efficiency, at 56 p.ct., 10 p.ct. in advance) is worthy of the palm; though it is open to doubt whether one can generalize with certainty from this particular instance. In any case the author has done good service to the industry by setting out the results of his work at Cardiff.

Is the Coal Mines Bill Necessary?

ON several occasions recently, when discussing the Government's proposed coal legislation, we have urged the point that the mines might reasonably be given a little more time to work out their own salvation on the lines upon which they have been proceeding lately. In this connection, recent statistics to which we refer in a later column are eloquent. One week in December showed the highest output for any week since one in May, 1924, when, it will be remembered, the boomlet due to the Ruhr occupation was in full swing. Supporters of the marketing scheme will urge that it is wrong to dispose of such quantities of coal unprofitably, and that restriction is clearly needed. But, if we consider the figures for the first nine months of the year, we find that the industry as a whole practically paid its way for the first time for several years.

It seems unfortunate that, at what looks like the turning point in a great struggle, the industry should be subjected to another upheaval. Of course, this natural recovery is based upon the eight-hour day, with its lower costs of production, while the Government is pledged to give the miners a seven-hour day. But it seems at least doubtful whether they will appreciate the limitation of earnings which is implied by output restriction, as compared with the increased average number of shifts worked per man, with maintained earnings per shift, which has been a feature of the past year.

Adequate Street Lighting.

THE recognized moment for forming fresh good resolutions has now passed for another year; but there is one so important that it should not be permitted to wait for 1931 to come round. Within as many days last week, mention was made at three inquests of roads suffering from inadequate lighting; the inquiries being in connection with motor fatalities. At Lewisham, a woman was knocked down by a car, and the Jury called the attention of the Borough Council to the inadequate lighting of Bromley Road, Catford. Similarly, the bad lighting of London Road, Reading, a main thoroughfare, was the subject of a rider to the verdict of the Jury engaged in investigating the death of a man who had been struck by a car. There was at Wimbledon a horrible fatality involving the loss of three lives; and here a public official stated in evidence that "the road, although light on one "side, was dark on the other, and the kerb would be "difficult to see in a low car."

This, then, is the state of affairs. What is to be done? The good resolution which we commend to public lighting engineers, and others having authority in such matters, is that they will leave no stone unturned to secure more adequate street lighting wherever there may be need for it. We do not advocate the turning of highways into speed tracks for motorists at all hours of the twenty-four; but such inquiries as those to which we have here drawn attention afford conclusive proof—if people's own eyes had not already in numberless instances furnished it—of the immediate need of reform in the matter of illumination. Street lighting, of course, costs money; but so do many less important things the cash for which is always forthcoming. Here we have a matter of life and death—no less. By better lighting many thoroughfares can be rendered safer; and when the true facts are realized, who will desire to refuse the necessary money? By what measure shall one decide between sacrifice of life and "something more on the rates?"

In numerous places there exists irrefutable proof that gas can provide just the even, not dazzling, but amply sufficient, and fog-penetrating light that is required to minister to the safety of the roads; and once installed, it is there whenever wanted, without any irritating lapses at most inconvenient moments. Thoroughfares perfectly lighted by these means are known to all of us; but there are a far greater number that stand in need of drastic improvement. In too many places public lighting has not kept pace with altered traffic conditions; and public authorities and officials concerned should see to it that this state of affairs is remedied without delay.

It is notorious that official statistics are seldom able to thrust home their lesson; and thus is reiteration rendered necessary. We suggest that a more serious view might be taken of the problem to which we are now referring had it been the custom to erect a small cross wherever a street fatality occurred. Is there any way so effective in bringing home to a non-combatant the meaning of the Great War as a picture of a soldiers' cemetery in France or Belgium?

Aviation Spirit from Low-Temperature Tar.

AN investigation of the Prudhomme catalytic method for the conversion of low-temperature "oil-tar" into light oils has been made by Dr. M. J. Stephan, as a result of which he puts forward the opinion that it should be closely watched by all collieries producing bituminous coal and by the owners of low-temperature carbonization systems who now experience great difficulty in showing a favourable balance-sheet. Known as the "Semo" process, it is applicable to all low-temperature carbonizing. Moreover, it is simple, consisting of the addition of "mixed" gas, water gas, and residual gas (from the catalyst chamber) to the coal distillation gases, and passing the whole, free from sulphur, over finely divided nickel and cobalt. After leaving the catalyst chamber, the oil vapours are fractionally condensed into heavy oils, middle light oils, and very light oils; and the quantity of aviation spirit (specific gravity, 0·727 !) is most remarkable. The latter can be used without further rectification as a motor spirit. Lubricating oil, and pitch suitable for varnish work, are also produced.

Up to the present, the process has been operated only in the laboratory, but Dr. Stephan states that a plant capable of treating 10 tons of coal a day is in course of erection. In the article published in later columns of our issue to-day, the author gives a hypothetical daily operation sheet, based upon a throughput of 350 tons a day, and he estimates a profit of £63,000 per annum on a plant costing £103,000. It will be noted that the corresponding figure for an "ordinary carbonization plant" (presumably any type of low-temperature unit) costing £92,000, is £30,000 per annum—a yield of 30 p.ct. on the capital. One may consequently be forgiven for suggesting that Dr. Stephan does not suffer from pessimism. However, in view of his observation that "the market in tar products, which form the main portion of the oil tar products by ordinary low-temperature carbonization, is rapidly becoming over-produced, which will make the sales of products from carbonization still more difficult," the progress of the Prudhomme method will be followed with no little interest.

The Ratepayers' Burden.

WHEN reviewing in last week's "JOURNAL" the year just left behind, allusion was made to the disabilities imposed upon industry by the crushing weight of Imperial taxation; and matter which has appeared in the newspapers since the penning of those lines has done nothing to bring re-assurance. Additional millions—many of them—are spoken of as likely to be required; and these—whatever may be the objects to which they are to be allocated—the country, at the present juncture, is obviously unable to afford. Any increased taxation, by still further hampering industry and lessening the spending power of the individual, would react upon all classes of the community, whether such extra burden were imposed directly or indirectly. Let us, therefore, hope that it may be avoided.

Meanwhile, the customary annual return has been received from Mr. W. Allison Davies, Borough Treasurer of Preston, in which he sets forth the rates levied in various towns, together with much other statistical information, for the year 1929-30; and we have turned to this, as one does to a barometer, for an indication of the outlook as regards local taxation. Comparing this with

the corresponding returns for the years 1927-28 and 1928-29, the figures at first glance are hopeful; but it has to be remembered that in this period there have come into operation new valuation lists, which must greatly influence the results. Where assessments have been raised—and this has doubtless been very generally the case—any advantage of a reduction of the rates in the pound may be illusory, or the balance may even be on the wrong side. When the return for 1930-31 arrives, twelve months hence, it will afford a better basis of comparison with this one; but on the present occasion, the figures must be taken with the reservation indicated. The return is, of course, not by any means intended to cover the country, but it does embrace a large number of representative cities and towns. There are, for example, quoted 84 county boroughs, over which the average rates levied were: 1927-28, 14s. 8d. in the pound; 1928-29, 14s. 4d.; and 1929-30, 13s. 4d. In the case of 101 boroughs, for the same three years, the respective averages have been 14s. 4d., 14s. 2d., and 12s. 9d.; and for 89 urban district councils, 15s. 10d., 15s. 5d., and 13s. 10d. Changes in the majority of the Metropolitan boroughs have also been in a downward direction.

Charter and By-Laws of the Institution.

A copy of the Royal Charter and By-Laws of the Institution of Gas Engineers can be obtained by any member of the Institution on application to the Secretary (Mr. J. R. W. Alexander) at 28, Grosvenor Gardens, Westminster, S.W. 1.

Necessity for Research.

One of the contributors to the proceedings of the American Gas Association annual convention last October—Mr. W. C. Beckjord—showed himself a staunch advocate of the value of research to the future prosperity of our industry; nor will our readers disagree with his observations which are published in later columns to-day. Research involves not only gas manufacturing and distribution processes; it should, and must, be applied to other branches of the industry as well. Mr. Beckjord states that, in its broadest scope, it will take up problems of accounting, office management, methods of handling customers, public relations, and methods of financing and planning for the future; and he suggests that a portion of the gas engineer's time should be devoted to visualizing problems from the point of view of one who knows nothing whatever of the details of the gas business—in other words, with his mind freed from precedent. In the last analysis, of course, propositions must be decided on that judgment which is essentially based upon past experience and confidence in the future. There is not the slightest doubt of the need for closer co-operation in the efforts of the research man, the operating man, and the man in charge of the financial side of the industry; and the attitude of mind to which we have just referred is likely to bring this about. Incidentally, Mr. Beckjord speaks of the development in the work of the American Gas Association Testing Laboratory at Cleveland. Originally it was founded with the express idea of testing apparatus which was to be sold to, and used by, the public, but this idea has expanded into a broader treatment of current problems. The Laboratory is veritably a fact-investigation ground.

Loud Speakers.

For a time, people were content to keep their loud speakers more or less hidden away, as it were, in their own premises; but such a golden opportunity was too good to be lost, and now all manner of weird noises are apt to assail one when walking abroad. Unless controlled in some way, this may in time become an intolerable nuisance; and it is not surprising to note that objection is already being taken to such a method of securing publicity. We are all for advertising; but it should be of a kind which can cause no annoyance to others.

Daylight Effect of Incandescent Gas.

In a previous column, attention is drawn to the pre-eminent advantages of gas for public lighting; and in doing so, we are reminded of a letter appearing recently in the "Yorkshire Post" which put this matter very plainly. The writer, Miss Jessie M. Dreschfield, was dealing with the suggestion that street lighting should be so improved as to permit of motorists shutting-off their lighting sets when passing through towns, and she said: "Electric lighting in the towns often leaves much to be desired. Clear glass bulbs, revealing their incandescent filaments either directly or by means of mirrors, are too often a positive danger to traffic. These, I feel, should be banned altogether. The streams of light proceeding from them are frequently directed straight at oncoming traffic, with a grave risk of unsighting drivers. Motoring friends agree that incandescent gas is the most effective and safest form of street lighting. The light is soft and well diffused, and shadows—that bogey of motor traffic—are almost non-existent. In London, for example, there is no finer instance of public lighting than Regent Street, which is gas-illuminated from end to end. Motorists returning to town from the south must have noted with satisfaction in passing through South London that many of the main roads are brilliantly lit by gas, with no hint of glare. It only seems a question of increasing the number of gas lamps, therefore, to get a full 'daylight' effect, which would dispense with the need of lighting-up."

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Jan. 11.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Joint meeting with Eastern District at Edinburgh. Address by Mr. H. J. Toogood, of Elland.

Jan. 11.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—See Western District.

Jan. 11.—WESTERN JUNIOR GAS ASSOCIATION.—Meeting at Bristol. Paper by Mr. M. Barash, of West's Gas Improvement Company.

Jan. 11.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Wandsworth Works of the Wandsworth, Wimbledon, and Epsom District Gas Company.

Jan. 14.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Committee.

Jan. 14.—FEDERATION OF GAS EMPLOYERS.—Meeting of the Central Committee.

Jan. 15.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1.

Jan. 16.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Jan. 18.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting in Bradford. Paper by Dr. J. A. Sugden (Leeds University) on "Refractories."

Jan. 22.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in the Northern District, Gas Offices, Grainger Street West, Newcastle, 3.45 p.m.

Jan. 24.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in Scotland, North British Station Hotel, Glasgow, 2.15 p.m.

Jan. 25.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Meeting in Glasgow. Paper by Mr. Alex. Tran, of Helensburgh, "Some Notes on Ferro-Concrete." Also, Mr. A. McFarlane will read his Thesis which gained the Diploma of the Institution of Gas Engineers.

Jan. 30.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting in Birmingham. Paper by Mr. C. Featherstone Hammond, of Messrs. Submerged Combustion, Ltd., on "Submerged Combustion."

Jan. 31.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Paper by Mr. G. Percival on "Horizontal Retorts."

Feb. 10.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Annual dinner and dance.

Industrial Co-partnership Association.—Mr. H. Wickham Steed will be the speaker at the next monthly lunch of the Association, which will take place at the Holborn Restaurant tomorrow at 1 o'clock. The Chair will be taken by Colonel David Carnegie, C.B.E. An attractive speaker, and one of the most distinguished of contemporary publicists, Mr. Steed was successively Foreign Editor and Editor of "The Times," and is now Editor and Proprietor of "The Review of Reviews." He has chosen "Co-Operation and Social Peace" as his subject on this occasion.

Personal.

Mr. JOHN TERRACE, M.Inst.C.E., Chief Engineer to the South Suburban Gas Company, has been elected a Member of the Institution of Chemical Engineers.

Mr. J. R. WILLIS ALEXANDER, M.A., LL.B., actively commenced his duties as Secretary of the Institution of Gas Engineers on Jan. 1. He spent the month of December, 1929, in Yorkshire, and particularly in Leeds, in gaining an insight into the various branches of the gas industry. Considerable time was spent in the several departments of different types of gas undertaking, and visits were paid to the Coal Gas and Fuel Department of the University of Leeds, to a coke oven plant, a colliery, District Association meetings and conferences, and to the works of large industrial users of gas. The arrangements were made by the President of the Institution, Mr. C. S. Shapley, the Engineer and General Manager of the Leeds Gas Department.

Mr. T. P. COOPER, collector for the York Gas Company, has retired after nearly 53 years' service. He began work with the Company on May 1, 1877, when the Lord Mayor of the City (the late Mr. James Melrose) and the Sheriff of York (Mr. T. Porter Bulmer) were both Directors of the Gas Company. Mr. Cooper has contributed literary work on gas subjects both to "The Bulletin" of the British Commercial Gas Association and also the local Press. A keen student of local history, he utilized his special knowledge in this direction to good purpose during the centenary celebrations of the York Gas Company in 1924, in associating the romantic history of the community with the historic documents and the wonderful display of early lighting appliances which was exhibited by the Company—and described by Mr. Cooper—and a good many of which were subsequently exhibited at the British Empire Exhibition at Wembley. Mr. Cooper has published several books and many articles on various phases of York history. He is the author of a valuable brochure on the armorial bearings and regalia of the city of York, a copy of which was accepted by the King. The new Cap of Maintenance, presented to York in 1915 by His Majesty the King, was designed, and its make-up was supervised, by Mr. Cooper, by special request of the City Council.

At a special meeting of the Manchester City Justices Gas Meter Testing Committee, held on Dec. 6, Mr. H. N. BARROW and Mr. HAROLD KING were appointed Chairman and Vice-Chairman respectively for the tenth successive year.

In the New Year Honours List appears the name of WILLIAM EDWARD WHYTE, O.B.E., Clerk to the Middle Ward District Committee of Lanarkshire, who has been created a Knight.

Mr. JULIUS BRADBURY, of 8, Court House Gardens, Finchley, N. 3, late Manager of Messrs. Thos. Duxbury & Co., of Manchester and London, has taken up a position as a Representative of Messrs. Renwick, Wilton, & Co., Ltd., Coal Contractors, in their Gas Coal and Chemical Department.

Obituary.

A cablegram has been received announcing the death in South Africa of Mr. JOSIAH H. DAVIES, a former Gas Manager at Oswaldtwistle, aged 45. He left Lancashire in 1924, after 17 years' service with the Oswaldtwistle Council.

The death occurred, on Jan. 2, at Adel, of Col. ARTHUR BRAY, T.D., Chairman of George Bray & Co., Ltd., gas lighting engineers, of Leeds. Deceased, who was 52 years of age, was the second son of the late Mr. George Bray, founder of the firm.

The death has occurred of Mr. CHARLES HENRY SANDEMAN, at the age of 61. Deceased, who was the brother of Mr. W. J. Sandeman, of Croydon, had been for over 46 years in the service of the Brighton and Hove General Gas Company, and there were present at the funeral on Dec. 30 about 110 representatives of the Company's departments and employees.

Mr. VICTOR FALK died on Dec. 28, at Bournemouth, after a short illness, at the age of 62. Deceased was one of the founders, in 1887, of the firm of Falk, Stadelmann, & Co., Ltd., and for a number of years was widely known throughout the gas lighting and heating industry. Since 1912, owing to indifferent health, he had not actively participated in the management of the business, though he retained his position on the Board of Directors and maintained his interests in the Company.

Correspondence.

[*We are not responsible for opinions expressed by Correspondents.*]

Deaths from Carbon Monoxide Poisoning.

SIR,—In the issue of the "GAS JOURNAL" for Nov. 13, 1929, I notice that Prof. J. S. Haldane, in giving evidence before the Gas Poisoning Committee, said he thought the Pearce Committee were entirely misled by some amazing official evidence from America, and that the frequency of accidents by poisoning when undiluted carburetted water gas was used there was notorious, and there was no reason to doubt that there would be a more or less similar frequency in Great Britain in similar circumstances.

Prof. Haldane seems to magnify unduly the influence of carbon monoxide content upon the accidental deaths from poisoning by town gas in America; and to believe that conditions affecting such accidents are the same as in Great Britain. Unless all such conditions are the same, his conclusions have no value. It would seem that if comparisons are to be made they should be based upon the results of changes in the character of the gas supplied at different periods to the same community; but there are only a few communities for which such comparisons are possible.

In connection with a hearing before a Committee of the House of Representatives of the Congress of the United States in January, 1909, I obtained and produced some figures showing comparisons of this kind for the cities of Baltimore and Chicago. For Baltimore for the five years 1893 to 1897 inclusive, in which the gas supply was entirely carburetted water gas, there were 54 accidental deaths from asphyxiation, including deaths from suffocation due to conflagration, an average of 10·8 per year. The average population of Baltimore for this period was 484,000, and the average number of deaths from asphyxiation per year per 100,000 of population was 2·2. For a later five-year period, 1897 to 1901 inclusive, during which the supply of gas was still entirely carburetted water gas, the total number of accidental deaths was 63, or 12·6 per year, the average population was 510,000, and the average deaths from asphyxiation per 100,000 of population were 2·5. During the five-year period from 1904 to 1908 inclusive, a large amount of coke oven gas was purchased each year, and the gas supplied averaged 45 p.ct. of coal gas and 55 p.ct. of water gas. The total number of accidental deaths from asphyxiation was 63—exactly the same as for the five-year period from 1897 to 1901. The estimated average population was 535,000, and the average number of deaths per 100,000 was 2·3. Thus there was practically no difference in the number of deaths per 100,000 of population between the periods in which the gas distributed was 100 p.ct. carburetted water gas and that in which the gas distributed contained 55 p.ct. of carburetted water gas. On Prof. Haldane's theory there should have been a very much larger number of deaths, both absolute and in proportion, during the earlier periods.

For Chicago during the five-year period 1886 to 1890 inclusive, in which the gas distributed contained a large percentage of coal gas, though it is impossible to obtain the exact percentage, the average number of deaths per year from asphyxiation from all kinds of noxious gases, including illuminating gas, was 4·3 per 100,000 of population. For the five-year period 1893 to 1897 inclusive, during which the gas supply was entirely carburetted

water gas, the average number of deaths per 100,000 of population was 3·4 per year, a decrease of practically 25 p.ct. in the number of deaths per 100,000 of population concurrently with the change from a gas containing only a small percentage of carburetted water gas to straight carburetted water gas.

I attempted to obtain similar statistics for San Francisco, where oil gas having a composition almost the same as that of coal gas was substituted for straight carburetted water gas. Unfortunately the earlier records needed for that city were destroyed in the fire of 1906.

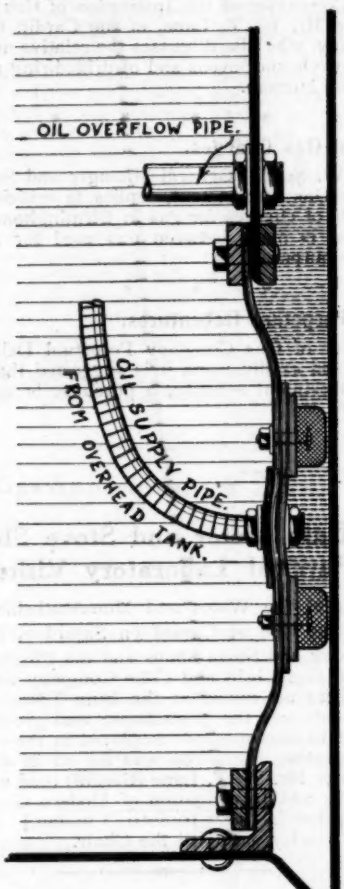
Prof. Haldane may consider these figures as being "amazing" statistical evidence, but most people will consider them as being statistical evidence which controverts Prof. Haldane's theory apparently based merely upon what he thinks should occur.

ALFRED E. FORSTALL.

233, Broadway,
New York,
Dec. 19, 1929.

Seal Arrangement for Waterless Holders.

SIR,—We have noted the letter of "Aqualess" in your issue for Jan. 1, regarding our patent seal arrangement for waterless gasholders, and would ask your indulgence to answer one or two queries he raises.



First, in regard to his reference to the diaphragm, the webbing of which must of necessity be sufficiently stout to answer its purpose, and with an ample margin of safety, the diaphragm itself, being under constant pressure in one direction only, will not thereby be subject to alternate bending stresses, and the webbing comprising this diaphragm is something of the texture and thickness usually employed in balata belts, but without the rubber insertion, owing to the detrimental action which oil has on rubber. This webbing is admirably suited to the purpose by reason of its flexibility, and also is gas, water, and oil tight.

In regard to the oil-supply tank being above the water level, thus giving a higher pressure in the space between the rubbing pads, this is really an advantage, though there is no real objection to these supply tanks being at the same level as the water in the annular tank, if so desired. The advantages obtained by placing the oil-supply tanks at a higher level is that the greater pressure thus obtained will naturally force a film of oil between the rubbing pads and the shell, thereby reducing friction and giving almost a frictionless contact—in a similar manner to that which obtains in an ordinary shaft bearing. The appended sketch will explain this point more clearly.

The oil-supply pipe from the higher tank level is shown connected to the space between the rubbers, and this pressure tends to make the oil try to escape the best way it can, which will be between the surface of the rubbers and the gasholder shell.

The water pressure from the annular tank, being on a larger area of the diaphragm than the higher oil pressure, will still keep the pads up to the gasholder shell, and any oil which may escape past the top rubber will discharge into the space above until it overflows at the overflow level. The oil which escapes between the shell and the lower rubber will gravitate to the bottom of the gasholder, where it will be collected in a sump and re-pumped.

We think the above fully answers the points raised by "Aqualess," and we thank you for giving us this opportunity of explanation.

WILLIAM BLAKELEY,
Managing Director.

Firth Blakeley, Sons & Co., Ltd.,
Church Fenton, Jan. 4, 1930.

A User's View of the Coal Problem.

SIR,—I note that in the issue of "Gas" dated Dec. 25, 1929, Mr. Shapley made a definite reference to the Tinsley Park Colliery in his speech before the Leeds Luncheon Club on Dec. 9 last. It must be admitted that no industry can be judged by a few isolated cases; and if Mr. Shapley had chosen another Sheffield colliery, a very different story would have been told. This particular concern lost over £70,000 on its operations for the year ended Sept. 30, 1928.

Other critics of Mr. Shapley's speech have pointed out that this gentleman's statements are not borne out by facts; and though I am not in the slightest degree offering an apology for Tinsley Park's sound financial position, I must point out a very glaring inaccuracy in the statement appearing in the journal mentioned.

Mr. Shapley states that the capital reserve was £71,000; general reserve, £80,000; dividend equalization account, £12,000; investments, £211,000; *making a total of £374,000.* If Mr. Shapley will again examine the Tinsley Park balance-sheet, he will find the £71,000, £80,000, and £12,000 on the *liabilities* side of the balance-sheet, and the £211,000 on the *assets* side of the balance-sheet, which simply means that the reserve funds have been prudently *invested.* If correctly reported, Mr. Shapley has only made an error of *£211,000.*

It is a well-known fact that a colliery's main asset is its coalfield, and a prudent company must build up reserves to enable it either ultimately to return its capital to its shareholders and close down, or secure interests in other coalfields to equal the wastage of its original seams. Mr. Shapley knows quite well that the coal trade is in a serious condition, and in common fairness he should base his arguments on the trade as a whole.

The Mines Department publishes the figures quarterly, and any member of the public can examine these documents and judge between Mr. Shapley and the coal trade. The total accumulated loss ascertained in respect of the coalfields of Great Britain from the commencement of work after the 1926 strike up to June 30, 1929, was £13,690,363; and this does not include bank and debenture interest.

J. W. HAZEL,
Secretary.

The Tinsley Park Colliery Company, Ltd.,
Sheffield, Jan. 2, 1930.

Gas Escape Caused by Steam Roller.—"Death from gas poisoning caused by an escape from a main broken by a steam roller," was the verdict of a jury at the inquest on Mrs. Ellen Coleman, of the lodge of the British Military Hospital, at Leopardstown, Co. Dublin. Mrs. Coleman was found unconscious in bed, and her husband was also unconscious. The room was full of gas, though all gas taps in the house were turned off. The husband stated that when he went to the help of his wife he became dizzy, and he remembered no more until he awakened in hospital.

High-Pressure Ring Gas Main for Midlands City.—The Coventry Gas Committee are submitting a scheme for the approval of the City Council, for the provision of a high-pressure "ring" gas main, with feeder mains, round the city, at an estimated cost of £109,895. The ring main, it is explained, would run from Foleshill Gas-Works around the city. This would result in a constant pressure throughout the area of supply, and would enable the Kenilworth Gas-Works to be discontinued for manufacturing, besides presenting other advantages.

In To-Day's "Journal."

Carbon Monoxide Poisoning.

Some highly significant statistics are contained in a letter from Mr. Alfred E. Forstall, of New York, who deals with the evidence given by Prof. J. S. Haldane before the Gas Poisoning Committee, on the subject of carbon monoxide content and accidental deaths from poisoning by town gas in America.

* * * *

New Gas-Operated Refrigerator.

A patent for a gas-operated refrigerator employing ammonia as the refrigerant and active charcoal as the adsorbent has been taken out by Mr. C. A. Masterman and the Gas Light and Coke Company.

* * * *

Promoting the Use of Gas for Cooking.

Excellent arrangements have been made by the London Gas Exhibit Committee in organizing a baking competition in connection with the Cookery and Food Exhibition which commences at Olympia next Tuesday.

* * * *

Meters for Mains.

An installation of disc meters at Bournemouth for continuously measuring the amount of gas passing through trunk mains in the Bournemouth Gas Company's area is described and illustrated.

* * * *

Books Reviewed.

"Standard Methods for Testing Tar and Its Products" (published by the Standardization of Tar Products Tests Committee) is reviewed by Mr. E. W. Muddiman. A note on "The Time Journey of Dr. Barton," by John Hodgson, also appears. The latter book contains twenty imaginative drawings, and is a summary, painted on a broad canvas, but with precise detail, of the origins and possibilities of Western progress. "Dr. Barton" puts forward for criticism and consideration the directions in which it seems desirable that the Western people should endeavour to move. It is a most stimulating work.

Conversion of Low-Temperature Tar into Light Oils.

The Prudhomme catalytic process for the conversion into light oils of "oil tar" from low-temperature carbonization of coal is discussed by Dr. M. J. Stephen. As a commercial proposition, he says, the process is still in its infancy. A plant capable of treating 10 tons per day is in course of erection. "The experiences gained by many tests with a trial plant, the sound scientific basis, and the thorough manner in which it has been applied for practical use are a guarantee that the system can be adopted for commercial purposes. The progress of Prudhomme's invention should be closely watched by all collieries producing bituminous coal and by the owners of low-temperature carbonization processes who experience now great difficulty in showing a favourable balance-sheet."

* * * *

Cooker Tests.

Modifications in the cooker tests specified by the Gas Investigation Committee of the Institution of Gas Engineers are suggested by Mr. W. T. Lane, of the Cardiff Gas Light and Coke Company, who also discusses the relative merits of single-burner and two-burner ovens and of drilled-ring and spreading-flame hotplate burners.

* * * *

Birmingham Gas Charges.

Mr. A. W. Smith, General Manager and Secretary of the Birmingham Gas Department, replies to criticisms regarding the new scale of charges for gas in Birmingham, in which no differentiation is made between gas used for manufacturing and lighting purposes.

* * * *

Attractive Perpetual Debentures.

A number of Gas Company Perpetual Debenture Stocks are now quoted *ex* div.; and it is suggested that, for a really high-class investment security, a purchase is well worth consideration.

Traders Criticize New Gas Charges in Large Industrial City.

The new scale of charges for gas in Birmingham, in which no differentiation is made between gas used for manufacturing and lighting purposes, has excited some criticism among a number of manufacturers. It is said (observes the "Birmingham Post") that the change actually means an advance in price to small manufacturers instead of a reduction, but it is pointed out on behalf of the Gas Department that the concessions which have been made, on the basis of last year's consumption, will cost the Department something like £75,000.

A correspondent who criticizes the new arrangement points out that the new price of gas for a consumption per quarter of between 50,000 and 100,000 c.ft., is 2s. 11d. per 1000. The old rate was 2s. 8d. for manufacturing, and 3s. 2d. for lighting. The revised rate is a reduction of 3d. per 1000 off lighting and an advance of 3d. per 1000 on manufacturing. It is clear that, as the manufacturer's consumption is very much greater for the purposes of manufacturing, instead of getting a reduction of price, he is getting his price advanced.

BENEFIT FOR 230,000 CONSUMERS.

Mr. A. W. Smith (General Manager of the Birmingham Gas Department) stated that the concession which had been made would, on the basis of last year's consumption, cost the Department something like £75,000. In making the change it was felt that the one scale would be more equitable, though some small manufacturers will have to pay rather more, because, compared with their industrial load, they use very little gas for lighting and cooking. Out of a total of approximately 250,000 gas consumers, it is estimated that about 230,000 will have a reduction under the new system. In the few cases where a larger sum has to be paid it is not expected that this will amount to much more than a few shillings per quarter. In former days the differentiation was made with a view to attracting a day load; but conditions have now greatly changed, with a big increase in the use of gas for cooking in canteens and so forth. It is felt, therefore, that it would be better now to dispense with the differentiation which has regard to the purposes for which the gas is used.

Up-to-Date Meter and Stove Shops and Physical Laboratory Visited.

A Meeting of the Wales and Monmouthshire Junior Gas Association was held at Cardiff on Saturday, Dec. 14, 1929, when the Meter and Stove Shops and the Physical Laboratory of the Cardiff Gas Light and Coke Company were inspected.

The members assembled at the Bute Terrace Works, and were conducted over the workshops; and great interest was shown in the various methods employed in the carrying-out of repairs and testing, &c. Tea was served in the staff mess-room, and later Mr. W. T. Lane (Cardiff) read a paper entitled "The Testing and Investigation of Modern Gas Appliances." [This is published in the "JOURNAL" to-day.] The President, Mr. W. E. Crowley, occupied the Chair.

Chairman of Electricity Committee Congratulates Gas Committee.

A reduction in the price of gas was announced at a meeting of the Newcastle (Staffs.) Town Council on Jan. 1.

The decreases recommended in the report of the Gas Committee, and approved by the Council, were as follows: Ordinary meters from 3s. 7d. (*less* 3d. discount) to 3s. 3d. (*less* 3d. discount); industrial meters to remain at 3s. 3d. (*less* 3d. discount); and slot meters from 3s. 10d. net to 3s. 6d. net. These prices will also come into operation following the meter readings for the December quarter.

The CHAIRMAN of the Gas Committee (Mr. E. M. Hollins), in presenting his report, said the reduction now conceded of 4d. per c.ft., making the charge 3s. instead of 3s. 4d., brought the price back to within 4d. of the pre-war figure. It was the considered opinion of the Committee that this reduction could be made without loss on the previous year's working. They had taken into account the developments and improvements that had been decided upon.

He was not unduly optimistic, he continued, in saying that when the proposed retort house reconstruction at the gas-works was carried out they would have one of the most up-

to-date works in the country, and that they would be able to produce gas at a price very little above the pre-war level. He looked forward to the time when the price might come down to 2s. 8d.

Alderman MYOTT (Chairman of the Electricity Committee) congratulated the Gas Committee, and drew attention to the fact that next September the remaining £3500 on the old loan would be cleared. That would make the works free of debt. Then he was sure they could look forward to a further reduction.

London Companies Encourage Use of Gas for Baking Gingerbread.

Those who spent too much on Christmas presents will have a chance to mitigate ill-effects on bank balances at the Cookery and Food Exhibition which opens at Olympia on Tuesday, Jan. 14.

A prize competition is being organized by the London Gas Exhibit Committee, and it is open to all residents in the areas of the following undertakings: Commercial, Croydon, Gas Light and Coke, South Metropolitan, South Suburban, Tottenham and District, and Wandsworth, Wimbledon, and Epsom.

The competition is divided into two sections: (1) For children up to and including 14 years of age; (2) for adults and children over 14 years of age. The competitors have the choice of making (*a*) a fruit cake; (*b*) a madeira cake; (*c*) gingerbread. The prizes in the children's group are three firsts of £2 and a gold medal, and three seconds of £1 and a silver medal. The first prize in each of the three groups for adults is £4 and gas appliances to the value of £4; and the second prize is £2 and gas appliances to the value of £2. Recipes are supplied by the Committee, but this is no drawback, for the judges have purposely chosen economical ones.

There are two conditions. The cakes must be baked in a gas oven, and a certificate to this effect, signed by a responsible person, must accompany each entry. Secondly, all cakes will become the property of the Committee, who intend to send them to various children's Homes and Institutions in the London area. Entry forms and all information can be obtained from the Hon. Secretary, London Gas Exhibit Committee, 84, Horseferry Road, Westminster, S.W. 1, or from any local gas showrooms.

Frost and Gas Apparatus.—A Timely Warning

The Birmingham Gas Department are preparing themselves for another cold spell this year, and have issued a timely warning in the Press to their consumers in connection with the freezing of gas meters and appliances. The notice is as follows:

> Considerable inconvenience can be avoided if precautionary measures are taken to prevent the freezing of meters and appliances. Meters should be protected with papers, hay, or cloths, and a moderate temperature should be maintained in rooms where geysers or other water heating apparatus are fixed. If by-passes or pilot lights are kept alight, this is usually sufficient to remove any danger of freezing in these appliances.

New Gas-Works for Elgin.—The Elgin Town Council, at a meeting on Dec. 30, gave instructions to the Town Clerk to make formal application to the Unemployment Grants Committee for a grant for the erection of new gas-works, the cost of which is estimated at from £38,000 to £40,000.

Progress of Gas in Weymouth.—With justifiable pride, the Chairman of the Weymouth Consumers' Gas Company (Mr. M. C. Frowde), at the annual dinner given by the Directors to the employees on Dec. 21, traced the Company's remarkable progress and expansion, touching particularly on the outstanding event of the year—the passing of the Company's new Provisional Order. The dinner was held as usual in the Burdon Hall.

Bussey Distillation Plant at Glenboig.—The following message from their Glenboig correspondent appeared in the "Financial Times" some days ago: A blow has been struck at Glenboig by the closing for an indefinite period of the Bussey Coal Company's plant. The works were officially opened last July, and since then the plant has been working with regularity on the three-shift system. Mr. A. Powell (the Chairman), when interviewed, said that the works had been closed only temporarily, in order that the auxiliary apparatus for dealing with the distillation of oil could be enlarged to cope with the whole of the oil output. "When we re-open, which will be in about two months' time, all fourteen retorts will be in day and night operation, and we shall be able to give more employment than before."

The Coal Industry Shows Continued Progress.

Recently issued statistics of the coal trade further emphasize the recovery which has been a feature of the official returns for the past year. The output for the whole of Great Britain in the week ended Dec. 21 was the highest figure reached since May 17, 1924, and it reached a total of 5,647,200 tons, against 5,399,400 in the preceding week.

The Mines Department statistical summary for the September quarter of 1929 likewise makes very satisfactory reading, and the following comparison with the corresponding period of 1928 is interesting:

—	September Quarter.	
	1929.	1928.
Output, tons	60,497,604	53,552,053
Exports and foreign bunkers, tons	20,349,841	16,645,600
Total costs per ton	13s. 9¾d.	14s. 5d.
Costs other than wages, per ton	4s. 6½d.	4s. 11d.
Average earnings per shift (excluding allowances)	9s. 2¾d.	9s. 3¼d.
Average number of shifts worked per person employed	63·22	58·98
Average number employed	894,390	859,259
Proceeds of commercial disposals, per ton	13s. 8¾d.	13s.
"Debit," per ton	¼d.	1s. 4d.

Noteworthy features are the increases in output, in exports, in the proportion of exports to output, and in employment. Average earnings per shift have been practically maintained, and, since the average number of shifts worked per man has increased, the actual average income must have been higher.

The Mining Association makes the following comments on the Department's return: "By aggregating the results of this quarter with those of the two previous quarters of this year it appears that the industry shows a 'credit' of 2d. per ton for the first nine months of the year. This 'credit' is not, of course, a net profit, since there are certain items—*e.g.*, interest on bank loans and overdrafts estimated to amount to at least 3d. per ton—that are treated as 'inadmissible' for the purpose of the wages ascertainments from which these returns are compiled. When these items are taken into account the industry is still hardly paying its way."

Corporation Purchases Gas-Works at Rotherham Main Colliery.

Arrangements are being concluded for the purchase by the Rotherham Corporation from Messrs. John Brown & Co. of their gas undertaking at Rotherham Main Colliery, which supplies gas for domestic purposes to the parishes of Brinsworth and Whiston.

The gas sold by the Company is approximately 14 million c.ft. a year, and the purchase of the undertaking includes five miles of mains, 140 cookers and fires, and 81 street lamps. The estimated revenue of the undertaking is £2000 per annum.

The Royal Sanitary Institute.—At an Examination for Smoke Inspectors, held in London on Dec. 13 and 14, two candidates presented themselves and satisfied the Examiners and passed the Examination: J. Bowers, Willesden; and J. S. Ratcliffe, Kensal Rise.

The Travel Association's Calendar for 1930.—Within the small compass of 48 pages, measuring 3 in. by 5 in., the Travel Association of Great Britain and Ireland have compressed a great deal of information which will be invaluable to visitors. This pocket calendar contains a day-to-day diary of 500 leading events of 1930 throughout the British Isles; lists of shows, exhibitions, festivals, celebrations, and old-world customs; information upon a score of different subjects, including customs, passports, taxes, means of transport, motoring, hotels, postal arrangements; and notes on some special features of life in this country which are particularly attractive to visitors from abroad, and in which the position of this country is unique. Mention is also made of the classes of goods in the manufacture of which Britain leads the world, and there are some interesting figures regarding the weather which should serve to dispel some erroneous ideas. The whole presents in small compass a wonderful picture of life in the British Isles. Printed in clear, open-faced red and black type with a foreword by the Prime Minister, the Calendar is designed to arouse the interest of the foreign tourist and overseas business man by showing what a wide variety of interesting and important events are held in the British Isles during the year. The calendar is intended for circulation abroad, and will be issued in four editions. The English edition of half-a-million copies is now out, and is being despatched abroad. This edition will be followed by 300,000 copies in French, Spanish, and German.

Commercial and Industrial.

Stock Market Report.

[For Stock and Share List, see later page.]

A short week on the Stock Exchange and the close proximity of dividend disbursements lessened the volume of business last week, and there were very few transactions recorded in the Gas Market. There was only one variation in the quotations—that of the British ordinary stock, which fell 1 point to 112-117, business being done at the lower price.

Three additions have been made to the Stock and Share List—viz., Cambridge £100,000 5 p.ct. debenture, Ottoman 12,000 £5 ordinary shares, and Tuscan, Ltd., 82,380 £10 ordinary shares and £85,701 6 p.ct. debenture stock. This list now includes all Gas Stocks and Shares quoted on the London Stock Exchange Official List, and in addition to stocks of the Chester, Derby, and South Shields Companies which are quoted on the local Exchanges only.

A number of perpetual debenture stocks are now quoted *ex* div.; and for a really high-class investment security a purchase is well worth consideration, as the following list shows:

—	Present Average Price.	Yield P.Ct. per Annum.
		£ s. d.
Bournemouth 3 p.ct.	54½	5 10 1
Commercial 3 p.ct.	55½	5 8 1
Gas Light 3 p.ct.	57½	5 5 3
Maidstone 3 p.ct.	53½	5 12 2
Newcastle 3½ p.ct.	65½	5 6 5
South Suburban 5 p.ct.	93½	5 6 9
Southampton 4 p.ct.	69	5 15 11
Tottenham 4 p.ct.	73½	5 8 10
Wandsworth 3 p.ct.	54½	5 10 1
,, 4 p.ct.	73½	5 8 10
,, 5 p.ct.	93	5 7 6

Coal Markets.

Very quiet conditions have ruled again in all the markets, but, now that the New Year holidays are out of the way, a resumption of brisk business is anticipated. Inquiry is satisfactory for all periods, and collieries are firm in their ideas, but there is little disposition on the part of buyers to go on for long periods at current prices. In other words, forward business is difficult to negotiate pending developments in connection with the marketing schemes and coal legislation generally.

Prompt quotations show little change. Durham gas coals are well supplied with orders, and Wear specials are firmly quoted at 17s. 6d. f.o.b., best qualities being 16s. 9d., and seconds 15s. to 15s. 6d. Yorkshire screened gas are approximately 18s. to 18s. 6d. f.o.b. usual ports, with washed trebles 18s. to 18s. 6d., doubles 17s. 6d. to 18s., and singles 15s. 6d. to 16s. 3d.

Gas coke is still firm on all markets, prices ruling about 25s. to 26s. f.o.b. or delivered.

Trade Notes.

Retort Resetting at Blackburn.

The Blackburn Town Council, on Jan. 2, approved the tender of Messrs. West's Gas Improvement Company for resetting three beds of Glover-West vertical retorts at the Greenbank Gas-Works.

Contracts Open.

Pipes and Fittings.

The Clonmel Corporation invite tenders for cast-iron gas mains and fittings. [See advert. on p. 102.]

Bilston Gas Light and Coke Company.—The profit and loss account, after paying the interim dividends, shows a credit balance of £10,948. It is proposed to pay further dividends of 5s. 6d. per share on the "A" shares, *less* tax, and 4s. per share on the "B" shares, *less* tax (making with the interim dividends paid in July last, 11s. and 8s. per share respectively, *less* tax for the year, leaving thereafter a balance of £8800). The Directors report that under date Nov. 22, 1929, a Special Order of the Board of Trade was made definitely defining the Company's area of supply. The Directors have found it necessary to replace, at considerable cost, one of the gasholders; and the work on this is nearing completion. It will be necessary in the near future to replace the other gasholder. To meet this expenditure, the Directors have under consideration the question of raising further capital by mortgage or by an issue of debentures, of which notice will be given in due course.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 6.

There are no changes to report in the prices of tar products.

Creosote for export is 6¼d. to 6½d. per gallon f.o.b.

Pitch is 47s. 6d. per ton f.o.b.

Pure toluole is 2s. 5d. to 2s. 6d.; 95/160 solvent naphtha, about 1s. 5d.; pure benzole, about 1s. 11d.; and pyridine bases, about 3s. 9d. all per gallon.

Tar Products in the Provinces.

Jan. 6.

The average prices of gas-works products during the week were: Gas-works tar, 25s. to 30s. Pitch—East Coast, 47s. 6d. f.o.b. West Coast (f.a.s.) Manchester, 42s. to 42s. 6d.; Liverpool, 45s. 6d. to 46s. 6d.; Clyde, 45s. 6d. to 46s. 6d. Toluole, naked, North, 1s. 7¼d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3¾d.; low gravity, 2d. to 2¼d.; Scotland, 3¼d. to 3¾d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. 4d. to 2s. 6d. prompt. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Tar Products in Scotland.

GLASGOW, *Jan.* 4.

Practically no business has been transacted during the week owing to the holidays. Most products are steady with an upward tendency. Creosote oil continues to cause some anxiety, but even this article is better in tone.

Pitch is still scarce, and value remains firm at 47s. 6d. to 50s. per ton f.a.s. Glasgow, *plus* about 5s. per ton for home trade.

Tar remains firm, and better prices are anticipated shortly. Value is about 4d. to 4¼d. per gallon free on rails at works in buyers' packages.

Creosote.—The position is better; but export orders would be welcomed. B.E.S.A. specification is 3¾d. to 4⅛d. per gallon; light oils, 3¼d to 3⅝d. per gallon; neutral oil, 3d. to 3¼d. per gallon, all *ex* works.

Cresylic.—Stocks in this area are low, and prices remain steady at 1s. 9½d. to 1s. 10½d. per gallon for 97/99 p.ct. pale, 1s. 8d. to 1s. 9d. per gallon for 97/99 p.ct. dark, 2s. 1d. to 2s. 2d. per gallon for 99/100 p.ct. pale, and 1s. 11d. to 2s. per gallon for high boiling.

Crude naphtha is easier at about 5¼d. to 6d. per gallon f.o.r. works.

Solvent Naphtha.—90/160 grade remains at 1s. 1¾d. to 1s. 2d. per gallon, and 90/190 grade at 1s. to 1s. 0½d. per gallon.

Motor benzole is 1s. 5d. to 1s. 5½d. per gallon. Orders are scarce at the moment.

Pyridine is unchanged at about 3s. 3d. to 3s. 6d. per gallon for 90/160 quality.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole	0 10	to 0 11	per gallon at works
Motor ,,	1 5	,, 1 6	,, ,, ,,
90 p.ct. ,,	1 7	,, 1 8	,, ,,
Pure ,,	1 10	,, 1 11	,, ,, ,,

From Cubic Feet to Therms.—The Goole Urban District Council have decided to change over to the therm system of charging for gas. The existing price is 3s. 6d. per 1000 c.ft., and under the new system will be 10d. per therm.

New Gasholder for Centre of Woollen Industry.—Bradford Corporation's Finance (Estimates) Sub-Committee—which has control over the expenditure by all other Committees—has approved the proposed erection of a new gasholder at the Valley Road Gas-Works.

Forres Gas-Works Explosion.—Damage estimated at between £600 and £700 was caused by an explosion and fire which occurred at the Forres Gas-Works at 3 o'clock in the morning of Dec. 26. The explosion took place in the meter house and one employee received burns.

At Keighley, on Dec. 24, Eleanor Paine, a young married woman of nineteen, was bound over for twelve months, and ordered to pay costs, in respect of a charge of stealing 16s. 3d. from the gas meter at her sister's house, and stealing 15s. 4d. from the gas meter at her own house.

"Accidental death," with a rider that no blame attached to anyone, was the verdict of the jury at a Chesterfield inquest, held on Dec. 24, on Walter H. Knowles (62), of Chesterfield, who died from injuries received when attending to the stoking machinery at the Corporation Gas-Works.

Works of the Colombo Gas and Water Company.

By WALTER T. DUNN, M.I.Mech.E.

One's first impression on entering the offices which adjoin the works belonging to the Colombo Gas and Water Company is that here there dwells a keen spirit of commercial enterprise. The stairway leading up to the general offices and the engineers' sanctums are utilized for urging the claims of gas. The lettering, which is neatly painted on the upright part of each stair, exhorts the beholder to "Use Gas for Lighting and Cooking." The Engineer and General Manager is Mr. S. Barker Johnson, M.I.Mech.E., F.C.S., M.I.Chem.E.

There are a meter-repairing shop, and a smiths' shop where the wrought-iron work for the Colombo Gas Undertaking standards for public lighting is turned out. In the carbonizing department the plant consists of horizontal retorts with a Guest-Gibbons charging and discharging machine doing excellent work. The period of carbonizing is twelve hours. The stock of coke seen was not so large as at Hong Kong. It is readily sold for a variety of purposes. With a temperature of 85° Fahr. in the shade in winter time, there cannot, of course, be any demand for either gas or coke in the direction of heating. Lighting and cooking alone are sought for, and the business is distinctly on the increase, as will be observed from the following figures:

For the year	1919	97,053,000 c.ft.
,, ,,	1920	113,997,000 ,,
,, ,,	1921	124,625,000 ,,
,, ,,	1922	133,632,000 ,,
,, ,,	1923	148,826,000 ,,
,, ,,	1924	168,359,000 ,,
,, ,,	1925	185,706,000 ,,
,, ,,	1926	220,426,000 ,,
,, ,,	1927	271,245,000 ,,
,, ,,	1928	299,482,000 ,,
,, ,,	1929	350,000,000 ,,

As to the area of supply, it may be stated that the whole of the city of Colombo is served—an area of about 8300 acres. Its length is some 8 miles, and breadth about 3 miles. The length of mains is 150 miles approximately. The site of the works is very restricted, the area being only 2 acres. Additional land is situated in the south part of the city at Greenlands Road, Havelock Town, and contains a gasholder, booster plant, and governors. The works are about a mile away from the harbour, and no railway lines are available. The coal stores consist of eight sheds, five on the north side and three on the south side of the works. The former set has a capacity of 1870 tons; the latter, 1030 tons. There is an approximate storage in the open of some 1000 tons on the north side, and some 900 tons on the south side, giving the works a total storage capacity of about 4800 tons.

The writer was interested and surprised when told that no governors are used in the retort house, for the reason that they will not function. Mr. Barker Johnson is of the opinion that this is due to the climate of Colombo, the high temperature of which has already been referred to. It will be readily appreciated that in the tropics far greater condensing apparatus is required than is necessary in colder climates. Two sets of condensers, tar separator, Livesey washer, and tower scrubber (two) are placed on the inlet side of the exhauster. The Directors of the Company are at the present time considering what had best be done to provide the further manufacturing plant demanded by the ever-increasing number of consumers.

A new up-to-date showroom was built in 1924 on the site of No. 1 north coal store. Two 10 ft. by 6 ft. plate glass windows were fitted into the gable wall facing Gas-Works Street. The showroom is artistically tiled in white, and the floor is of polished red cement. A receiving base for goods from the wharf was erected in 1924 from the main stores building, so that all cases and crates coming in can be first unpacked and dealt with, thus relieving the main store of undue packing material.

In Colombo, gas was first introduced for street lighting, and considerable historical and sentimental interest therefore attaches to this section of the Company's activities. The Engineer at Colombo declares that the art of successful public lighting consists in devoting close attention to the following four essentials: (1) Adequacy of illumination; (2) steadiness and constancy of the light source; (3) absence of glare; (4) cost must be the minimum compatible with the provision of adequate service. During the war, no utility service was ever so disorganized or was so disrupted as was the public lighting department of a city. Colombo was no exception to this. The public have become so inured to doing without perfect lighting that even now, probably, it is only in a few instances that public lighting has reached anything like its pre-war condition. In Colombo itself, the year 1923 was the first year since 1914 that all the public lamps in the city were lighted.

The volume of gas used for public lighting purposes in 1919 was 13,224,800 c.ft., equal to 13·6 p.ct. of the total output—an increase of 4,413,900 c.ft., or 50·09 p.ct., on the 1918 figures. In 1920 the price of gas was reduced by 50 cents per 1000 c.ft., and the Council increased the number of lighted lamps by one hundred. The volume of gas used in that year was 16,020,000 c.ft., or 14·05 p.ct. of the total volume manufactured, and was an increase of 21·1 p.ct. over the previous year's output of gas for street lighting. In 1921 very few extensions were undertaken in the public lighting programme, and the gas used totalled 17,540,000 c.ft.—14·07 p.ct. of the total output. During the year 1921, however, steps were taken to introduce better lighting of the street junctions, and generally to convert the old No. 3 Kern upright Welsbach burners to more modern lines of street lamp lighting. With a view to getting the Council to light all the lamps in the city, it was agreed that, for the minor roads and lanes, a burner of smaller candle-power than the ordinary No. 3 would suffice. The best suggestion that Mr. Barker Johnson could make was that the No. 1 Bijou inverted "conversion fitting" manufactured by Messrs. William Sugg & Co. should be adopted. Samples were sent out and tried, and it was decided that by using a convex reflector and bijou burner, as against the ordinary concave reflector and No. 3 burner, quite a satisfactory light could be obtained, and one perfectly sufficient for minor roads, &c. Accordingly these were ultimately decided upon, and 11,622 of such fittings were attached to the street lanterns in the year 1922.

S. Barker Johnson, M.I.Mech.E.

In addition to the suggestion of conversion from upright to inverted burners in regard to the bijou fittings, Mr. Johnson began a movement to secure better lighting of the junctions and main roads by means of arc gas lamp lighting, and the type of lamp experimented with was the 3-light "Littleton" arc lamp, which is manufactured by Messrs. William Sugg & Co. After several months of experimental work the idea of attaching a bracket arm to the existing street lamp columns, raising the height of the lamp, and extending the arm of the bracket some 8 ft. over the road, and attaching an arc gas lamp to it seemed to be an ideal way of attaining "central lighting." In July, 1921, Mr. Barker Johnson designed the first bracket. It was erected, and at once received the entire approval of everyone concerned. Since that date, a few unimportant alterations and improvements have been effected in the "Swing-Arm-Bracket" device, but the original general arrangement remains. Columns carrying arc lamps are spaced 90 to 100 yards apart on the staggered principle. The ordinary street lamp columns carrying No. 3 burners are spaced 70 yards apart in the main roads and 75 yards apart in those of lesser importance. It has been found by actual practice that the maintenance charges of these lamps are extraordinarily low—some 2·5 mantles per burner per annum. It is no exaggeration to say that the idea has revolutionized street lighting in the City of Colombo; it has ousted all electric competition so far as public lighting is concerned.

On the Electrical Side.

Happenings at Hereford.

There is a proposal to transfer to the Shropshire, Worcestershire, and Staffordshire Electric Power Company the electricity undertaking of the Hereford Corporation; and a public inquiry on the subject has been held. From a statement made during the proceedings, that the result of the working of the whole undertaking for the fifteen years ended March last has been a total loss of £30,609, it would seem that the Council have arrived at a wise decision. In view of the supposed desire of country communities for the blessings of electricity, the figures in this case are significant; for while there has been a surplus in the city area, the rural service over the nine years during which it has operated has shown a deficiency of £53,363. To place the undertaking in a satisfactory position, a very large immediate capital expenditure is necessary. The first witness called at the inquiry advised the transfer, as there is no prospect of the Corporation being able to carry on the rural supply without serious loss. He added that "if the Corporation were to give away the rural undertaking for nothing, it would be doing a good stroke of business." If the scheme is carried through, Hereford will be worked in conjunction with the Stourbridge station.

More Statistics.

Some figures from the official engineering and financial report in connection with authorized undertakings for the year to March, 1928, were quoted in last week's "JOURNAL;" and it is now possible to supplement these by later statistics culled from the ninth annual report of the Electricity Commissioners, dealing with the year ended March last. This report has just been published by H.M. Stationery Office, at the price of 3s. net. It appears that the five Regional Schemes which had been adopted at the date named cover about 43 p.ct. of the total area, and no less than 75 p.ct. of the population, of Great Britain, and embrace the limits of supply of some 450 authorized undertakers, whose operations accounted for upwards of 80 p.ct. of the total sales of electricity to consumers in Great Britain in 1927-28. Including the Central Electricity Board, the number of separate undertakers at March, 1929, was 659, an addition of 17 to the figures for 1928. Authorized undertakings developed 9,473,201,134 units, while railway and tramway authorities and non-statutory undertakings brought the total to 10,878,980,925 units. This was an increase of upwards of 9·5 p.ct. on the figures for 1928. The larger output was obtained by an increase of only 3·7 p.ct. in the amount of coal and coke consumed; and there was a falling-off by about 4800 tons in the amount of oil fuel employed. The production of electricity at the stations included within the scope of the returns has increased by upwards of 110 p.ct. since 1920-21, representing an average increase of 13·8 p.ct. per annum during the past eight years. There has been an all-round increase of 60 p.ct. in the amount of electricity produced per ton of coal and coke consumed for that purpose compared with 1920-21.

Rural Supplies.

On the basis of the estimated total population of Great Britain at the end of 1928—namely, 44,370,000—the sales of electricity from public sources of supply in that year represented an average consumption of 171 units per head. It is stated in the report that one of the most important problems of the next few years will be to ensure that the additional facilities are utilized to the best advantage in providing an electrical service for as large a proportion of the rural population as the economic circumstances of the supply will permit. This matter has already been receiving considerable attention by undertakers who are engaged in extending supplies from urban areas into surrounding rural territory, and also by those charged with the development of areas more remote from the larger centres of population and wholly or preponderatingly rural in character. The rural parishes supplied at March 31, 1929, numbered 1435, and those not supplied 3047. The Commissioners propose to continue a systematic review of the progress made in the provision of distributing mains in rural areas, and to explore the causes of, or reasons for, non-development in particular cases, in order to encourage and facilitate the establishment of a supply of electricity wherever there appears to be a reasonable prospect of supplies being given on a remunerative basis.

Notes on New Books.

STANDARD METHODS FOR TESTING TAR AND ITS PRODUCTS.*

Reviewed by E. W. MUDDIMAN.

In these "Standard Methods for Testing Tar and Its Products," published shortly before Christmas, are the first results of the suggestion, made by Mr. W. G. Adam, in his paper at the Tar Conference held in Manchester in November, 1926, that the methods of testing tar and its constituents should be standardized. A strong Committee, with Mr. W. J. U. Woolcock, and, later, Mr. H. W. James, as Chairman, was formed under the auspices of the Joint Fuel Committee, and the work to be undertaken was allocated to seven panels. After nearly two years they have published their recommendations and the tests which are considered necessary to standardize for the purpose of present-day practice in the tar distillation industry. A certain amount of the work of the Committee has already been before the industry in the form of tests for road tar (adopted by the British Engineering Standards Association) and for the light oil fractions prepared for the Specifications Committee of the National Benzole Association.

For the purpose of the tests described later, definitions and descriptions of all the tar products are laid down. With regard to sampling the materials before analysis, the Committee have adopted certain general principles. They realize that no set of rules, however explicit, can take the place of judgment, skill, and experience; and the sampling directions given are intended to supplement such experience and serve as a guide in selecting the best method. The quantities of each sample must be at least three times the minimum necessary for a complete series of tests. For liquids, sampling may be carried out by open tube, or by metal tube with bottom valve operated from the top, or by weighted can for sampling at any level. For solids like naphthalene and anthracene a scoop, long enough to go through the package and having a hammer head for driving into barrels, is suggested; sketches of suitable apparatus are given. Glass apparatus is required for sampling pyridine, carbolic and cresylic acids, and benzole and its homologues; it is advisable to use amber or dark blue bottles for storing these. Viscous and partly solidified liquids must be warmed until mobile, and agitated before sampling, with special precautions in the case of carbolic acid crystals. For pitch in barrels, samples of equal size are taken from an agreed number, after first removing the upper two inches; for pitch in bays, samples from the complete depth of the face at one or more places, all lumps to be broken to pass a 3-in. screen. The usual instructions for reduction of bulk samples by coning and quartering are given.

As there are many different types of crude tar, and as tar and tar products from such sources as low-temperature carbonization processes are slowly increasing in amount, a preliminary examination is recommended. This small-scale "sorting-test" for classifying tar samples consists of either (*a*) straight distillation of the dry tar from a distillation flask immersed in a Wood metal bath, and examination of fractions at 40 degree ranges for specific gravity, caustic soda extract, &c., or (*b*) treatment with solvents. In the latter method, which is more particularly applicable to low-temperature tars, the dry tar is extracted quantitatively with light petrol, and the petrol extract washed first with caustic soda to remove phenolic bodies, then with acetic acid to dissolve bases, and the residual neutral oil measured after removal of the petrol by distillation. The petrol-insoluble portion is extracted with benzole, and the dry residue weighed. Each separated fraction is examined, and a table is given to facilitate recording of the tests.

For the commercial analysis of high-temperature tars, a charge of 5 litres is distilled from a steel still as specified, and fractions to 280° C., and 280° C. to pitch, are collected. The fractions are examined for tar acids, pyridine bases, naphthalene, and anthracene, and the pitch for twisting-point and specific gravity.

The tests specified for refined tar (including road tar) include viscosity at 30° C. by modified Redwood viscometer, specific gravity, free carbon by toluole extraction, distillation, tar acids in fraction to 270° C., and naphthalene deposited to 15·5° C. from the 200°-270° C. fraction.

The examination of the lower-boiling fractions obtained from coal tar receives careful consideration. The general tests for which apparatus and method of procedure have been standardized are flash-point, crystallizing-point, distillation, bases, tar acids, acid-washing with Lovibond tintometer comparison, paraffins using Young's sulphonation apparatus, total sulphur

* "Standard Methods for Testing Tar and Its Products." Published by the Standardization of Tar Products Tests Committee, price 7s. 6d. net.

by W. B. Davidson's apparatus, free sulphur by Ormandy and Craven's method (as modified by the Joint Benzole Research Committee), and unsaturated hydrocarbons by bromine absorption. For the estimation of benzene and its homologues, carbon disulphide, and paraffins in the various low-boiling fractions of coal tar which are articles of commerce, recourse is made to the methods of Spielmann and Butler-Jones, of Northall Laurie, and of Colman and Yeoman—so useful during the war. Naphthalene is determined by White's picrate method, and thiophene by shaking with Denigès reagent. A qualitative test for thiotolene is included, but it is doubtful if its usefulness justifies its inclusion in the present volume.

The tests standardized for the examination of crude tar acids are the usual Lowe's test (Graesser's modification), water, pitch and phenol, pyridine bases, and neutral oils. Crystallizing point, distillation, and solubility methods are added for refined tar acids.

Commercial naphthalene is examined for crystallizing point, water, and phenolic bodies by bromide-bromate; in the case of refined naphthalene an acid-washing test is given, with comparison of colour with cobalt nitrate-sodium sulphide solutions.

In the analysis of tar bases, the methods employed consist mainly of a general examination of physical properties, probably because pyridine and similar heterocyclic bases are not used so much in industry, from a purely chemical point of view, as are other coal tar products. The Committee state that certain of the methods are to be regarded as indicated methods of procedure, and not as standard methods of analysis. Among the tests standardized are those for water, neutral oils, ammonia (T. Callan's titration method using sulphuric acid and thymol blue as indicator), ash, reactions with cadmium chloride and with Nessler's reagent, miscibility, and distillation from specified flask.

With regard to the valuation of creosote oil, the determinations recommended are for specific gravity, water, distillation, tar acids, insoluble matter, and solid hydrocarbons deposited at 15·5° C.; the usual temperature of 38° C. being prescribed for certain measurements.

For the analysis of crude anthracene, the well-known Höchst method of oxidation to anthraquinone and sublimation is adhered to, as the Committee do not consider the time opportune to recognize the alternative variations of this test which have appeared in recent literature.

Full details of apparatus required for the testing of pitch are given, and, as is the case with the majority of the preceding tar products, the publication of these is long overdue. The tests recommended are for (*a*) softening-point, based on Kraemar and Sarnow's method using 5 grammes of mercury over a cylinder of pitch 5 mm. long and 6·5 mm. in diameter, (*b*) fusing-point by suspension from a copper wire of a pitch cube 12·5 mm., edge in a water-bath, and (*c*) twisting-point using a Frankland Taylor pitch-testing machine with a 150 gramme weight. Volatile matter, "free carbon," and ash determinations are also included.

A complete list of apparatus schedules and a collection of the graphs required in some of the tests are given at the end of the book.

In the past, nearly all tar tests have been physical and not chemical, and, further, many have been purely empirical and designed by purchasers to suit their own requirements. In America attempts were made several years ago to systematize methods of analysis, but in this country, though some of the methods given above have been in general use, numerous modifications introduced in many laboratories where tar products were examined have led to the present lack of uniformity in what is now a highly technical industry. It will take some time for the application of the new standard methods to become general, owing to conservatism and perhaps bias in some quarters. It is also probable that, as the book becomes more widely used, modifications or additions may become necessary. The existence of the Committee will continue in the future, and the Editorial Panel will meet when necessary to consider suggestions. In the meantime, however, the methods form an excellent foundation to which possible improvements may be added later; and the Committee are to be congratulated on the excellent contribution they have made towards rationalization in the testing of tar and its products.

THE TIME JOURNEY OF DR. BARTON.*

The trouble arose when Roger and I were in the lounge of the "Metropole." We both had a coffee. The effect on Roger was most extraordinary. He floated vertically from his seat, and came to rest with his head against the ceiling. "What is the matter?" cried all present. "I have had a coffee," he replied from aloft. "But coffee does not have that effect," said those below. "That observation," remarked Roger, "is apparently untrue."

On reading "The Time Journey of Dr. Barton," by John Hodgson (of the firm of George Kent, Ltd.), who is well known to many of our readers, we alternated between the views of Roger and of the people seated in the "Metropole" lounge. The book is "an engineering and sociological forecast based on present possibilities," and contains many imaginative drawings of great merit. We are not at all sure that the author intends the ideas to be taken seriously; if so, then the world he depicts in A.D. 3927 will be a terrible place, and we are profoundly thankful that it will not fall to our lot to inhabit it. Though it may be heresy in an age of science, we like at times to be sybaritic. This, of course, is a purely personal view, and hence more or less worthless in a brief note such as this.

Broadly, "The Time Journey of Dr. Barton" is an exceedingly clever and stimulating book which would delight many of our readers. We believe, too, that they would enjoy the "notes" equally as well as the story itself.

* "The Time Journey of Dr. Barton," by John Hodgson. Published by John Hodgson, Eggington House, nr. Leighton Buzzard. Price 3s. 10d., post free.

THE COLLIERY MANAGER'S POCKET-BOOK, 1930.*

The 1930 edition of this pocket-book has been published. It contains a lengthy review of the progress in mining during 1929, and a mass of useful information for the colliery manager. In spite of its 456 pages, the size of the book is not unduly large; the printing is excellent, and the whole is well indexed.

* Published by the Colliery Guardian Company, Ltd., 30 and 31, Furnival Street, Holborn, E.C. 4. Price, cloth 3s., roan 4s. 6d., calf 6s.

Potential Investments.

XXVI.—Cardiff Gas Light and Coke Company.

The Cardiff Gas Company was incorporated by Special Act of Parliament in the year 1837, further Acts being obtained in 1854, 1870, 1887, 1906, and 1921. The Chief Office is at Bute Terrace, Cardiff.

The statutory area of supply covers about 65 square miles, and includes the parishes of Cardiff, Penarth and Llandough, Whitchurch, Lavernock, Leckwith, Lisvane, Llanedyrne, Michaelstone-le-pit, Radyr, St. Fagans, Eglwysilan, Sully, Caerau, Rumney, and St. Mellons. The consumers number 55,854, and there are 309 miles of mains. The population of the area is approximately 256,000.

The capital of the Company, as shown by the last accounts (December, 1928), is as follows:

CAPITAL STOCK.

	£
Consolidated ordinary stock	626,860
4½ p.ct. preference stock	96,410
Premiums (*less* expenses 1923 issue)	32,298
	£755,568
Remaining to be issued	203,501
Total amount authorized	£959,069

In 1906, £102,000 (included in above figure) was added on conversion of stocks.

LOAN CAPITAL.

	£
5 p.ct. perpetual debenture stock	51,000
4 " " " "	20,000
7½ " redeemable " "	237,860
Premiums received	222
	£309,082
Remaining to be borrowed	163,640
Total amount authorized	£472,722

Transfer Arrangements.—Common form. Registration fee; any document 2s. 6d. All classes of stock allowed (in multiples of £1) on same deed for one fee; smallest holding allowed £10. Spouse may not witness signature. Voting: One vote for £100 (or less) of ordinary stock, and one for every complete £100 beyond the first £100. Preference stock does not confer voting rights. Director's qualification, £1000 ordinary stock.

Accounts and Dividends.—Accounts made up to Dec. 31 and submitted in February, dividends (ordinary and preference) being paid in August and after the annual general meeting. The basic price of gas is 1s. 2½d. per therm, the present price is 8½d. per therm, and the declared calorific value is 470 B.Th.U. per c.ft. The basic rates of dividend (5 p.ct. on the ordinary capital issued before 1921 and not exceeding 7 p.ct. on that

issued thereafter) are subject to increase only on a division of surplus profits between ordinary stockholders and employee co-partners when the price of gas is below the basic price. In any reduction of the basic rates of dividend through insufficiency of funds a proportionate reduction is to be made in each dividend. No 7 p.ct. (basic) ordinary stock has as yet been issued.

The following table illustrates the progress of the Company during the past four years:

Year.	Price of Gas at Dec. 31.	Quantity Gas Sold.	Capital Employed (Net).	Gross Profit. (a)	Total Charge for Capital. (b)	Rate of Dividend P.Ct. per Annum.	Amount Carried Forward and Balance Reserve Fund.
	d.	Therms.	£	£	£		£
1925 .	9·0	8,731,967	963,874	65,109	64,786	6	65,496
1926 .	11·0	9,131,721	963,874	46,938	65,091	6	48,674
1927 .	8·8	8,958,665	963,874	72,552	65,469	6	58,506
1928 .	8·8	8,969,141	963,874	66,767	64,929	6	63,063

(a) After deduction of income-tax.
(b) Including amount (if any) placed to reserve fund.

NOTE.—The abnormal output for the year 1926 was due to the long drawn out coal stoppage, which, however, adversely affected the profits for the year.

The sales of gas in the two years 1925 and 1926 were about 5 p.ct. more than in the year immediately preceding. In 1927 the state of trade and unemployment difficulties brought about a decrease of just under 2 p.ct., but a slight improvement was registered in 1928, and there is no reason why the former rate of increase in the sales should not be again obtained with the anticipated improvement of trade in South Wales.

The ordinary stock is quoted on the London Exchange and also at Cardiff and Bristol; it is closely held, and market dealings are few. The following table shows the highest and lowest prices on the London Exchange for the past four years, and the yield p.ct. per annum calculated on the average price on the maximum dividend of 6 p.ct.:

Consolidated Ordinary Stock.

Year.	Transactions.		Dividend.	Yield P.Ct. per Annum on the Average Price.
	Highest.	Lowest.		
				£ s. d.
1925	104	103½	6	5 15 8
1926	98¼	96½	6	6 3 3
1927	103	100¼	6	5 18 1
1928	101	97	6	6 1 3

It will be observed that there has been very little variation in the price, and the present quotation is 98-101. There is a good deal of local support given to the stock in Cardiff, and most of the transactions pass through the local exchange. The prices so obtained are invariably slightly higher than in London; the quotation at the present time being ½ p.ct. above at 99-101.

Testing and Investigation of Modern Gas Appliances.

By W. T. LANE, of the Cardiff Gas Light and Coke Company.

[Wales and Monmouthshire Junior Gas Association, Cardiff, Dec. 14, 1929]

COOKERS.

The development of the cooking stove to its modern construction has taken place with great rapidity as a result of scientific investigation. Some cookers have been so complicated in design that it is feared that they cannot be worked successfully under the inexperienced hand of the modern housewife. Thermostatic oven control, automatic thermostatic flues, and complicated oven designs and flue positions have their place; but it must be remembered that the apparatus has to be sufficiently easy of manipulation to provide the husband with a meal to time.

When a cooker is to be tested, it is brought in to the physical laboratory just as it is received from the makers. It is then assembled, and any outstanding features are examined and noted. The panels from the oven doors are removed, and an experimental set is put in, using the existing packing. These experimental panels are drilled for the Temperature Maintenance Test, and are employed for the subsequent tests applied to the oven.

NORMAL MAXIMUM CONSUMPTION TEST.

The normal maximum consumption is that which may be required for the initial stage of cooking operations. Experience has shown that the consumption is not higher than will heat the oven up to 400° Fahr. in 12 minutes, for a packed oven

Cooker A.—Single cased, cast iron, slot type, not packed.
,, B.—Ordinary cast iron, packed.
,, C.—Bottom flue outlet, cast-iron sides, packed, two-burner oven.
,, D.—Bottom flue outlet, enamelled sides, packed, two-burner oven.
,, E.—Bottom flue outlet, enamelled sides, packed, single-burner oven.
,, F.—New pattern slot, cast-iron sides, packed.
,, G.—Bottom flue outlet, enamelled sides, one-burner oven, flames running horizontally across bottom of the oven.
,, H.—Single back burner, enamelled sides.

Cooker.	Oven Lit.	400° Fahr. at Centre.	Time Taken.	Temperature at Top.	Temperature at Bottom.	Rate per Hour.	Pressure.
			Min.	° Fahr.	° Fahr.	C.Ft.	
A . .	10.10	10.22	12	..	..	30	o/10ths.
B . .	11.18	11.21	3*	380	400	30	,,
C . .	12.5	12.15	10	420	374	25	,,
D . .	3.0	3.12	12	420	383	20	,,
E . .	9.42	9.55	13	430	320	17	,,
F . .	9.50	10.00	10	408	340	22	,,
G . .	10.17	10.28	11	422	380	18	,,
H . .	2.48	3.02	12	..	..	25	,,

* This rate cannot be altered, as this cooker has no adjustable nipples. Temperature spaces for cookers A, H are left blank, as it was impossible to obtain these temperatures.

—the pressure at the minimum of the district. If the temperature is not reached in 12 minutes, the hourly consumption is too low, and the injector must be carefully opened, and *vice versa*. It has been found that this rate of consumption is rather low for certain cookers. They may attain a temperature of 400° Fahr. in 12 minutes, but, when put to the practical test of cooking, an insufficient supply of gas is obtainable for satisfactory results. This indicates that a shorter period of (say) 8 to 10 minutes should be applied. If in the testing of a cooker it is found that the oven will heat up to 400° Fahr. in 10 minutes, and still pass the Factor of Safety Test, the adjustment is left at that rate. For this test three thermometer readings are taken, one in the centre of the oven, one at the top, and one at the bottom. In all subsequent tests, the cookers will be named A, B, &c. Their classification is as opposite.

It will be seen from these figures that the old type of cooker consumes far more gas per hour in the oven than does the newer pattern. For the same rate of consumption per hour—namely 10,200 B.Th.U.—the single cased cast-iron cooker will not conserve anything like the amount of heat conserved by the more modern pattern.

FACTOR OF SAFETY TEST.

If an oven can safely consume such an excess of gas over the normal as will result from a pressure increase of 2½ times the minimum district pressure, the appliance will be satisfactory. For this test the oven is shut up, and the smothering of the flames observed by a mirror. The pressure is set at 2½ times that used in the previous test. This will provide an increased consumption of approximately 60 p.ct. Floating or smothering of the flames indicates failure to pass the test. No "furniture" other than the side shelves and one grid shelf, to keep them apart, is left in the oven. The factors of safety of the above cookers were as follows:

Cooker.	Rate per Hour. C.Ft.	Smothering At or Below 60 P.Ct. Increase in Consumption.	Failed or Passed.
A . . .	30	..	Passed
B . . .	30	..	,,
C . . .	25	Flames elongated at 35 c.ft.	Failed
D . . .	20	..	Passed
E . . .	17	..	,,
F . . .	22	..	,,
G . . .	18	Flames elongated at 30 c.ft.	,, *
H . . .	25	..	,,

* Flames did not actually smother.

It will be seen that two of the new types of cooker have a tendency to smother. I would like to read an extract from a paper, "Appliances and Service," by Mr. B. J. Bell ("JOURNAL," Vol. 186, p. 470):

The normal maximum consumption test is the amount of heat sufficient to attain a temperature of 400° Fahr. in 12 minutes;

but it was found that some cookers with this requirement failed to function properly. With a consumption at the rate of 20 c.ft. per hour some cookers heated up to the necessary temperature in the prescribed time, but the heat evolved was not sufficient for general cooking purposes. Before a satisfactory cooking result could be obtained, the consumption of gas had to be increased to 30 c.ft. per hour. "Unfortunately "flame floating" was distinctly apparent and "smothering" imminent. Here we are faced with a concrete instance where the normal maximum consumption was not sufficient to fulfil the reasonable demands of the user; and yet the cooker could have passed the factor of safety test.

It would appear that the possibility of smothering is the bugbear of modern oven design; and it is the opinion of the writer that the factor of safety test should not be dependent upon the normal maximum consumption test for ascertaining its maximum pressure, but should be tested at a definite pressure—say, 100 tenths W.G. Whatever may be the average minimum district pressure of manufacturing towns, it does not necessarily follow that this will be the average minimum district pressure of (say) Cardiff. This reasoning is particularly true where a town may have developed in such a way that large suburban districts, lying some distance from the centre of the town, have to be supplied through existing mains. To supply these outside areas with a good quantity of gas, pressures have to be increased at the works. Consequently, intermediate consumers on the line of main receive their gas at anything up to 80 tenths, and yet 20 tenths may still be the minimum district pressure. I have mentioned the word "average" minimum district pressure because a minimum district pressure of nine districts out of ten may be 40 tenths, and yet in one district, for some reason or other, the minimum may be 20 tenths. If makers test their cookers at the legal minimum district pressure—namely, 20 tenths—then, if these cookers are placed on a district where the minimum pressure is (say) 50 tenths, they will not be satisfactory. The fitter cannot be expected to take with him a thermometer, and test the cooker for its normal maximum consumption. Further, cookers cannot be adjusted before they leave the local works.

An alternative suggestion is the fixing of an automatic pressure control device, such as a simple governor, on the supply pipe of the cooker. This has been tried with considerable satisfaction; a pressure of 30 tenths being maintained at the cooker while main pressures have fluctuated, reaching as high as 80 tenths. If governors were fitted to all new cookers, the factor of safety test could be entirely eliminated. "Smothering" should be considered from every point of view, and, if necessary, the subsequent tests revised. It certainly appears to be the stumbling block for ascertaining the worth of a cooker.

Temperature Maintenance Test.

If the oven satisfactorily passes the two previous tests, its value as an apparatus for arresting the heat of combustion has to be assessed. For this purpose, tests at two temperatures are necessary. The oven is lighted up, and the gas supply manipulated either automatically by thermostat or manually until a mean temperature of not less than 370° Fahr. above that of the test room temperature is attained and retained for two hours. In either case, when constant temperature conditions are apparently established, two consecutive readings of the meter over not less than ten minutes each must agree with one another. Then temperature readings in the oven may be commenced. [The author then described in detail the procedure for this test.] Three cookers have been examined:

Cooker D, bottom flue outlet, two burner oven.
" E, " " " single burner oven.
" F, new pattern slot, cast-iron sides.

Cooker E proved the most efficient, losing 425 B.Th.U. per sq. ft. per hour. Cooker D came next with a figure of 578, and then cooker F with a figure of 784.

Suitability for Cooking.

A cooker may satisfactorily pass the foregoing tests, but fail when actual cooking is attempted. A practical test is therefore essential, and a supply of proved dough should be procured. The oven must be heated up to 410° Fahr. before putting in the dough, and, when this is done, the pressure is increased to give a rise in consumption of over 20 p.ct. of that of the previous consumptions. This must be maintained for about five minutes, when the consumption must be regulated to give a temperature of not more than 400° Fahr. in the centre of the oven. The bread should be baked in approximately one hour; the time depending on the size and the number of loaves in the oven. In the three previous tests, attempts are made to follow the procedure as set down by the Gas Investigation Committee; but in the Suitability for Cooking Test it is not thought advisable to load the oven to the extent mentioned in the Report of the above Committee—namely, 6¾ lbs. per c.ft. of internal space. A test is carried out that will determine the oven's practical usefulness, and a more ordinary loading of the oven is applied—namely, four 1-lb. loaves to each oven. This applies to the average size oven.

This test is interesting inasmuch as it clearly points out the importance of initial cooking temperature—viz., the heating-up of the oven to the required temperature before placing in any food. In this respect the thermostatically controlled oven has a decided advantage. The older type of cooker heats up more quickly than the modern type, and one often receives complaints that food will not cook to satisfaction in a certain modern cooker, and that such foodstuffs as cake and meat become underdone. Investigation of the complaint often shows an insufficient period of heating-up, and, when the fault is remedied, satisfaction results.

Cooker.	Oven Lit.	Loaves Put In.	Loaves Changed Round.	Loaves Taken Out.	Time Taken for Baking.	Consumption.	Remarks.
					Hr. Mins.	C.Ft.	
A . .	10.15	10.30	11.00	11.20	0 50	29	(1)
B . .	10.15	10.30	11.00	11.30	1 0	33	(2)
C . .	10.00	10.15	..	11.00	0 45	19	(3)
D . .	9.52	10.07	10.37	10.52	0 45	19	(4)
E . .	9.56	10.10	11.05	11.20	1 10	18	"
G . .	9.20	9.40	10.20	10.45	1 5	20	"
H . .	9.45	10.00	10.45	11.00	1 0	23	"

(1) Bread burnt when on lower shelf; (2) oven had a tendency to burn on the sides; (3) resulting bread good, outer edges slightly burnt; (4) Resulting bread good.

The next form of test applied to the ovens of gas cookers does not appear in any of the reports of the Gas Investigation Committee, but is a method adopted by Mr. A. H. Barker, of University College, London. The text for this test will be found in the Fuel Research Board Report No. 9, "Testing of Ranges and Cooking Appliances."

Hotplate Burner Efficiency Test.

The hotplate burner efficiency tests on cookers are carried out by heating a copper container complete with a tight-fitting lid, thermometer, and stirrer. The rise in temperature is ascertained, and the result multiplied by the quantity of water in pounds. This figure, divided by figure for the corrected quantity of heat given out by the gas, and multiplied by 100, gives the efficiency. As hotplate burner design is still a controversial point, the second column in the results given below states the type of burner fitted in the different cookers. In cooker B the hotplate burners are under the old-type straight bar, and it will be seen that the efficiency is very low, while the remaining cookers, all new patterns, give much more creditable results. Cooker F, as has been mentioned before, is the new pattern slot cooker; and its improved design indicates higher efficiencies in nearly all respects.

Cooker.	Type of Burner.	Efficiency.	Rate per Hour.
		P.Ct.	C.Ft.
B . . .	Large ring type, old pattern . . .	33·21	18·5
B . . .	Small " " " " . . .	32·73	7·2
C & D .	Ring burner, new pattern	56·0	18·0
E . . .	Spreading flame burner, new pattern	46·52	18·0
F . . .	Ring type, new pattern, slot . . .	44·61	17·2
G . . .	" " " "	42·2	20·0

Flueless Heaters.

In a recent exhibition held at Cardiff, the Cardiff Gas Light and Coke Company were exhibiting, and whenever the question of the purchase of a flueless heater was broached it was always emphatically turned down; yet, not twenty yards away, a local heating firm was exhibiting and selling the very appliance that we were condemning. A properly constructed and properly fixed gas fire is one of the finest ventilators that any living room can have, but if these two points are not attended to, then it becomes the reverse. To illustrate this, a small flueless gas heater was tested; and an analysis of the products of combustion gave the following results:

Consumption per Hour, C.Ft.	Pressure. Tenths.	P.Ct. O_2.	P.Ct. CO_2.	P.Ct. CO.
18	30	13·0	6·4	*nil*
27	70	2·0	10·8	2·0

It is possible for a fitter to fix a flueless heater of this type at a low pressure period of the day. Pressures may be increased later, with harmful results.

Gas Fires.

The method of testing fires has been taken from the report of the Gas Heating Research Committee of the Institution of Gas Engineers. [The author at this stage gave a detailed description of the means of ascertaining the radiant efficiency of fires.]

The gas fires tested were:

No. 1.—Standard frame fire, 7 radiants.
No. 2.—Small frame fire, 5 radiants.
No. 3.—Inset fire, 7 radiants.
No. 4.— " " "

Fire	No. 1.	No. 2.	No. 3.	No. 4.
P.ct. of energy radiated as heat	32·6	29·81	22·92	24·31

It will be seen that the efficiency of the frame fire is higher than that of the inset fire. Undoubtedly, with the latter, one pays for appearance at the expense of efficiency.

NEW RADIANTS.

The introduction of new fuel has developed a new field in the sale of gas fires. Apart from its more pleasing appearance, it has the beneficial value as a source of heat rays which have the power to penetrate the skin without having a scorching effect. It was found that some pieces of this fuel had a tendency to turn black when used in certain fires. This matter was brought to our notice, and therefore various fires were tested, all being fitted with the new fuel. It was found that the fuel in one particular fire turned black when a badly formed flame was in evidence—distinctly so when the inner cone of the flame was split. The discoloured pieces of fuel were then transferred to a fire in which this fuel had burnt without any discoloration; and it was found that the blackened fuel lost its deficiency in a day or so. These pieces of fuel remain satisfactory, there being no indication of their former discoloration.

HOT WATER APPLIANCES.

The general efficiency of hot water appliances is rather on the low side; seldom being more than 60 p.ct. However, if a hot water appliance has a high thermal efficiency, it follows that the temperature of the flue gases will be low. This will lead to considerable condensation and corrosion. It is far more economical, in the long run, to have a high flue temperature and low efficiency than to have a low flue temperature and high efficiency, and place on the consumer the extra expense for the periodical renewal of flue pipe. Further, corrosion causes a bad appearance and dirt, apart from the possibility of blocking-up of the flue pipe.

The Cardiff Gas Company have been favouring the adoption of small water heaters, fixed to the existing system without interfering with it in any way. For the purpose of investigating this, an experimental appliance was constructed. The heater was made of iron pipe couplings and tees, and was fixed to a 20-gallon cylinder, and the whole packed with slag wool. The burner consisted of the injector of an ordinary burner, placed about 3 in. below the combustion tube. The surprising feature of the investigation was that, though the appliance was merely "rigged up" temporarily, it gave an efficiency of 80 p.ct.

There is on the market a small hot water heater, to be fixed to existing hot water systems. It is constructed of weldless steel throughout. The combustion chamber consists of a series of water tubes fitted in spiral form, continuing along the whole length of the boiler. This appliance is comparatively cheap to purchase, and the fixing cost is low. It is usually fitted to the flow and return pipes from the kitchen range. It was thought that the direct heat on the first tubes would have a deleterious effect, so a heater was supplied with the first two tubes removed, leaving more space for the complete combustion of the gas. The undermentioned particulars give the efficiencies of the two heaters, one as originally supplied, and the other boiler with the first two tubes removed:

—	First Heater.	Second Heater.
Water used, lbs.	300	300
Temperature of cold water, ° C.	23	18
,, hot ,, ° C.	43	33
Therefore, rise in temperature	20	15
Gas used, c.ft.	40	30
Calorific value, C.H.U.	261	265
Efficiency, p.ct.	57	56·6
Gas rate per hour, c.ft.	50	50

Owing to the construction of this boiler, the rate of production of hot water is good—12 gallons of water at 156° Fahr. in 20 minutes.

There is one other appliance worthy of note, since it is the first appliance the reader has tested which adopts the principle of a well-known physical law—that all polished surfaces reflect heat. The appliance itself is a water storage heater employed for hairdressing establishments. It is finished in highly polished nickel plate on copper, this considerably helping to increase the efficiency of the heater, and to maintain a high temperature with a low gas consumption when the heater is not in use.

Discussion.

The PRESIDENT (Mr. W. E. Crowley) inquired as to the cost of governors fixed to the supply pipe of cookers.

Mr. W. W. BEACH (Newport) said that no mention had been made as to the value of convected heat emitted by a gas fire. The introduction of the gas fire fuel had certainly improved the radiant heat given. Could the author furnish any information on the efficiency of grill burners?

Mr. L. COX (Cardiff) remarked that there was some doubt existing as to the relative efficiency of "ace" and "ring" burners on a gas cooker. His experience was that the ring type of burner, for all-round efficiency, proved superior. Had any tests been carried out on the inclined frame fire? In his opinion, the blackening of fuel was caused in most cases by the fuel breaking and entering the burner nozzles, thereby causing improper combustion.

Mr. A. W. STICKLER (Cardiff) asked the author if he had any experience with the "Balance" radiator. In his district the Welsh Board of Health insisted on this type of radiator, which was considered to be very suitable for institutions, such as hospitals, &c., where the presence of the products of combustion had to be rigidly avoided.

Mr. B. J. BELL (Cardiff) mentioned the inadvisability of fixing small heaters with flexible tube connections, especially in rooms where there was little ventilation. Several cases had come within his knowledge where these small heaters had been so fitted, with serious consequences. Salesmen should avoid the fixing of these heaters wherever possible. Results of tests of appliances at Cardiff were available at any time to members of the staff.

Mr. R. M. JONES (Newport) spoke of the strides made in the manufacture and testing of appliances in recent years.

Mr. A. C. PRANKARD (Cardiff) asked what type of cooker tap Mr. Lane considered the best.

Mr. J. VINEY (Cardiff) said he had been called upon recently to investigate a complaint regarding the thermostatic control not functioning. On examination, it was found that the latch of the oven door was not secure, thereby causing cold air to enter the oven during cooking operations. This, of course, had an adverse effect upon the thermostat, and a proper temperature was not obtained in the oven. He advised the periodical cleaning of gas fires, especially in bedrooms, as he found an accumulation of "fluff" entered the nipple injector, and caused improper combustion.

Mr. T. SMITH (Cardiff) thought it advisable to fix a tap on the supply pipe of a cooker, as at present it was found that consumers lost the main tap key, and were unable to shut off the gas supply if necessary.

Mr. LANE, speaking in regard to the fixing of governors on the supply pipe of cookers, regretted that he could not furnish any figures as to the cost. He referred, however, to the governor fixed in the Cardiff Laboratory. This was an expensive device to instal, being a large mercurial governor. No doubt a small diaphragm type would be suitable for the purpose mentioned. As to the value of radiant and convected heat, Mr. Lane said he considered that the radiant heat emitted by a gas fire was the best form of heat for living rooms. Some improvement was being made with grill burners, and recently he had discovered that one particular maker of cooking stoves had constructed a very efficient grill burner. Replying to Mr. Cox with regard to the relative efficiencies of "ace" and ring burners, he had recently made tests of these, with the following results: Ring burner, 56 p.ct. efficiency; "ace" burner, 42 p.ct. He had not carried out any tests with the inclined type of fire. Replying to Mr. Stickler, he explained why the "Balance" radiator was so useful for hospitals, &c. He agreed with Mr. Bell that small flueless heaters should not be fitted in bedrooms where there was inadequate ventilation. It was his own Company's wish that special attention should be directed to the elimination of such appliances. Replying to Mr. Prankard, Mr. Lane considered that the best type of cooker tap was the one that seated itself in when in use. The point raised by Mr. Viney was an important one, and Mr. Lane observed that it was most desirable that the door of a cooker should be well fitted, especially when thermostatic oven control was provided. In the modern bottom flue outlet cookers, it was of vital necessity that this should be assured; otherwise the whole principle of the oven would be destroyed. Time and again cookers had caused dissatisfaction owing to this simple fault. The fixing of a union tap on the supply pipe would have its advantages and disadvantages. There would be no loose keys, but it might lead to trouble where children were present. The Cardiff Company always adopted the fixing of the main cock to the supply pipe fitted with loose keys.

Mr. R. S. SNELLING (Newport) proposed a vote of thanks to Mr. Lane, and this was seconded by Mr. STICKLER and supported by Mr. C. S. THANE (Newport). The PRESIDENT also proposed that the best thanks be tendered to the Chairman and Directors of the Cardiff Gas Light and Coke Company for the excellent facilities afforded the Association.

Bomb Calorimeter Demonstrated in Birmingham to Midland Juniors.

Following Mr. G. C. Buttery's paper on "Flow Calorimeters," at a meeting of the Midland Junior Gas Association in Birmingham on Dec. 12 (see "JOURNAL" for Dec. 25, 1929, p. 840), Mr. J. N. Shorrock, M.Sc. (Tech), described in detail, and demonstrated the use of, the bomb calorimeter. He advocated the employment of two lead washers for sealing the Mahler Knoeker bomb, thus overcoming much of the trouble through leakage, and the use of a separate combustion furnace for the determination of hydrogen for net calorific values. Petrols, he explained, can be weighed out in small glass bulbs and burnt with three atmospheres pressure of carbon dioxide additional to the oxygen, to moderate the explosion. The necessity of very careful sampling was emphasized, and the probable errors were briefly discussed.

The President, Mr. A. R. Myhill, in the discussion, raised the question of determining the calorific value of gas in the bomb, and the lecturer replied that, while the calorific value of gases can be determined by the bomb with considerable accuracy, this is only of practical value in very exceptional circumstances. Various members took part in the discussion.

Both Mr. Buttery and Mr. Shorrock are of the Birmingham Gas Department.

Motor Transport.

The Case for the One-Ton Vehicle—Running Costs as Compared with the 12-Cwt. Van, and Some Suggestions as to the Type of Body Suitable for the Gas Concern.

In a previous article, detailed running costs were given to show how cheaply the twelve to fifteen cwt. van could be operated. The table published with that article indicated that £350 per annum represented the total cost (including whole-time driver's wages) of running this type of van for 20,000 miles per annum. There is an alternative, however, in the 1-ton vehicle, comparing very favourably in running costs with the smaller van, but giving more loading space. It is possible to purchase a chassis of this type, with a platform space of 8 ft. by 6 ft., which allows a large, roomy body to be fitted, and which will be a very useful all-round service vehicle. The initial cost is higher than the 12-cwt. van, but, on the other hand, the standing charges are on very much the same scale, while the running expenses are only slightly more.

This chassis is fitted with a very reliable, four-cylinder engine developing 31 H.P., three bearing crankshaft, side valves running in an oil bath, and lubricated by pressure. Three forward speeds, a 6-volt lighting system with three lamps, oil-gun lubrication for the chassis, and an engine-driven tyre pump are provided, while the chassis price includes a fifth wheel with tyre and tube.

A vehicle of this type may be expected to give at least 12 miles per gallon of petrol, 700 miles per gallon of oil, and 15,000 miles per set of five pneumatic tyres. These items, comprising the running expense section of the costs, give a pence-per-mile figure of 1·77 as against the 0·95d. per mile for the 12-cwt. van. The tax and insurance charges on the two vehicles are identical, while a larger amount has been allowed for garage in respect of the 1-ton vehicle. Depreciation has been calculated upon the same basis in both cases—*i.e.*, 20 p.ct. per annum. This 1-ton vehicle costs, in grey priming coat, £245, and allowing for painting to suit the gas undertaking, the total initial cost would be in the region of £260, which gives a depreciation figure of £52. The ton vehicle will entail standing charges, therefore, of £108, as against £91 for the 12-cwt. van. On a 20,000 miles per annum basis, the 1-ton vehicle costs only approximately £80 more than the less spacious 12-cwt. van, a difference worth the cost in view of the additional load and greater space available.

Readily Adaptable.

The 1-ton vehicle is adaptable for special body work. It can be fitted with light plywood divisions, arranged to slide in and out when required, for tools, spare parts, and standard fittings. There is room for special cupboards and lockers to contain either the driver's tools and spares, or emergency appliances for dealing with the maintenance of the undertaking's apparatus. Such tools and parts may be kept under lock and key; the locks can be standardized on half a dozen vehicles, if necessary, master keys being held by inspectors, so that any inspector could rely upon finding in any service van the necessary equipment to pass on to the staff engaged on repair work some distance from headquarters.

A van of this size lends itself admirably for publicity purposes. The sides are deep enough to carry a striking message, either in the form of a slogan which may be a feature of the gas undertaking's advertising, or in the form of a picture. As the van is already fitted with a 6-volt battery, some of the current could be used to light up a reproduction of a gas fire arranged in the centre of the sides and surrounded by a pictorial representation of a family sitting room.

Service vans are used very often after dark; in fact, during the winter, half of their running time may be after sunset. Here is an admirable opportunity to utilize vans with illuminated sides. This is a publicity method not yet adopted by the business community, yet the brightly-lit van, advertising the services rendered by the gas concern, would be commented upon by many thousands of people as it passed through the city streets and the dark roads of the suburbs. Advertising experts have advocated that posters should be lit at night, and the only reason why this plan is not adopted is solely on account of cost. This need not deter any firm from using a vehicle with illuminated sides, as the engine dynamo is generating electricity during its whole running time. It is a very simple matter to arrange for the dynamo to cut-in at a lower speed, while the 6-volt battery can be replaced by one of 12 volts and a larger capacity. Alternatively, two batteries, each of 12 volts, may be fitted, current being taken from the spare when the original has been exhausted. If, owing to the nature of the service, it is found impossible for the dynamo to maintain both batteries fully charged for illuminating the sides, almost any electrical contractor will undertake to re-charge one battery every two or three days for quite a small sum in comparison with the publicity which such a van would provide all through the winter months.

In the case of the 1-ton vehicle, there is ample storage room for duplication of the batteries, while the area of the body sides lends itself to effective publicity purposes.

Running Costs for One-Ton Vehicle.

Petrol—12 m.p.g., 1s. 5d. per gallon.
Oil—700 m.p.g., 5s. per gallon.
Tyres—15,000 miles per set of five, £21 per set, 32 in. by 4½ in.

Original cost	£245
Painting	15
Total	£260
Depreciation at 20 p.ct. per annum	£52

	Annual Mileage.					
	5000.		10,000.		20,000.	
	Actual Cost.	Cost per Mile.	Actual Cost.	Cost per Mile.	Actual Cost.	Cost per Mile.
	£ s. d.	d.	£ s. d.	d.	£ s. d.	d.
Running expenses—						
Petrol	28 8 8	1·36	56 17 7	1·36	113 15 2	1·36
Oil	1 15 0	0·08	3 10 0	0·08	7 0 0	0·08
Tyres	7 0 0	0·33	14 0 0	0·33	28 0 0	0·33
Totals	37 3 8	1·77	74 7 7	1·77	148 15 2	1·77
Standing charges—						
Tax	15 0 0	0·72	15 0 0	0·36	15 0 0	0·18
Insurance	15 2 6	0·72	15 2 6	0·36	15 2 6	0·18
Depreciation	52 0 0	2·49	52 0 0	1·24	52 0 0	0·62
Garage	26 0 0	1·24	26 0 0	0·62	26 0 0	0·31
Totals	108 2 6	5·17	108 2 6	2·58	108 2 6	1·29
Total running costs—						
Running expenses	37 3 8	1·77	74 7 7	1·77	148 15 2	1·77
Standing charges	108 2 6	5·17	108 2 6	2·58	108 2 6	1·29
Allow for repairs	10 0 0	0·48	15 0 0	0·36	20 0 0	0·14
Driver's wages	156 0 0	7·48	156 0 0	3·74	156 0 0	1·87
Totals	£311 6 2	14·91d.	£353 10 1	8·45d.	£432 17 8	5·07d.

Conversion of "Oil Tar" from Low-Temperature Carbonization of Coal into Light Oils.

By Dr. M. J. STEPHAN.

[From the "Colliery Guardian" for Dec. 6.]

The carbonization at low temperature of coal and other bituminous deposits has progressed to such an extent that many processes are now available for treating and obtaining the maximum of valuable products from suitable raw materials. The scientific basis, chemically as well as mechanically, of many systems has been more or less firmly established and their successful working has been proved by plants with a sufficiently large throughput per day.

There is a method for converting oil tars obtained by low-temperature carbonization from coal and other bituminous materials into benzenes and petrol, which deserves very serious attention. It is the result of many years research and experimental work by a French analytical chemist, Dr. Prudhomme. The process is known under the name of "Semo." The object of the invention is to recover from coal, &c., treated by a process of low-temperature carbonization, the maximum quantity of light oils which could be used as motor or aviation spirit. The ordinary methods now in use produce mainly heavy oils and a very small quantity of benzene. There is no particular system of carbonization necessary, as any process using low temperature would be suitable, the hot vapours being treated, without condensation, immediately they leave the retorts. The invention is based on a catalyzation process.

The reactions on hydrocarbons by catalyzation are well known through the works of Prof. Fischer and of the great French scientist, Sabatier. They are based on the chemical action by contact with an agent, which effects a chemical change or decomposition in the substances, while it remains itself unchanged. The best catalysts for hydrocarbon are nickel, cobalt, iron. Sabatier has further proved that high temperature and the electric spark transform methane into acetylene, which latter, combined with hydrogen, forms itself easily into benzene. Prudhomme, in trying to find a method for converting oil tar into light oils, succeeded in forming acetylene from methane without heat or electricity. Based upon these discoveries, he developed his process for treating oil tar by means of catalyzation for industrial purposes.

The process itself is a very simple chemical reaction. To the gases from the carbonization of bituminous material, which include saturated and non-saturated hydrocarbons and notably phenol, are added mixed gas, water gas, and residual gas in the catalyzator, with the result that an absorption of carbon takes place forming carbide. The catalytic reactions themselves are very complex and vary greatly according to the chemical composition of the raw material and other causes.

Prudhomme has fully recognized the great importance of removing any contact poison before the catalyzation process starts. A poison of that kind, usually present in bituminous deposits, is sulphur, and the oil tar gases have consequently to be entirely purified and freed from their sulphur contents. The thorough manner of this elimination has probably a great bearing on the remarkably satisfactory results obtained by this method.

RESULTS OF TRIALS.

A large number of trials with all kinds of bituminous materials have been made. They show that 75 to 90 p.ct. of light oils can be obtained from oil tar by this method, which include a fair percentage of aviation spirit. It is evident that results of that kind should be of the greatest importance to the coal industry in connection with low-temperature carbonization. Coals containing a fair amount of oil could convert the losses now suffered by so many collieries into appreciable profits.

To confirm the statements made by Prudhomme in his book, "Le Rio Pétrole," and convinced of the importance of this treatment, the writer took the opportunity to determine by personal observations whether or to what an extent the claims made could be verified by an actual test. The trials took place in the laboratory of Prudhomme at Paris, and they were carried out under our constant supervision day and night during one week, and all results and assays were either controlled by us or obtained with our co-operation.

The small trial plant for carbonization consists of four cylindrical retorts set horizontally and parallel to each other in a fireclay housing, each retort being externally fired by gas, which has a separate control. Tubes containing a weighed quantity of coal are placed in the retorts and heated on both sides by gas. The vapours from all four cylinders are collected in an iron tube at the opposite end of the apparatus.

The apparatus for catalyzation consists of two batteries of purifiers with three tubes each, and one battery of catalyzators with four tubes encased by a steel mantle. There are installations for heating the inside of the apparatus, for condensation of the petrol, a gasholder, and appliances for airblowing the purifiers and steam cleaning. The catalyzation plant is directly connected to the collector of the oil tar vapours from the carbonization plant which first enter the purifiers.

The function of the purifiers is to retain any sulphuric matter and to fix the sulphur. The tubes are charged with finely divided metals, which decompose the sulphuretted hydrogen received from the carbonization plant. While one of the purifier batteries is in action, the other, which has been in use previously, is submitted to an air current for the regeneration of the metal compounds in their oxidized state and for the recovery of the sulphur.

SAMPLES AT ANY TIME.

The catalyzators are charged with finely divided nickel and cobalt. The metal composition has been particularly studied, and has undergone a special treatment, so that it acts like a soft air cushion on the passing gases. The whole process can be controlled by taking samples at any time. The condensation of the gaseous compounds, after leaving the catalyzator, takes place in three different phases—by air cooling, by water cooling, by passing over activated carbon. By the first process the heaviest oils are obtained; by the second process the middle light oils. The third process retains the very light fractions still remaining after the two previous extractions. The residual gases go into the gasholder.

The material used at the trial was a Durham coking coal sent to France for that purpose. It was in small pieces and gave the following results on being analyzed in its natural state:

	P.Ct.
Moisture	1·26
Volatiles	24·64
Fixed carbons	68·50
Ash	5·60
Sulphur	0·87

The object of the trial was in the first instance to determine the quality of the coal and the quantities of the different products by ordinary low-temperature carbonization. The second part consisted of the catalyzation of the oil tar vapours obtained from the coal carbonized in the plant described above.

The temperature for carbonization purposes was raised up to 550° C. The catalyzation process demands much less heat, and there is consequently no heating of the catalyzation apparatus required, as the vapours enter the purifiers at about 350° to 400° C. and pass quickly through it. There must be, in fact, a control to avoid overheating the catalyzators, as the heat should not be higher than 230° C. The chemical reactions become more complex at higher degrees. The low temperature is also more favourable to the preservation of sensitive products that are being formed.

The results of the trials can be briefly summarized as follows: The quantity of coke was, of course, in both trials the same. The amount of ammoniacal liquor differed slightly but gave within a few fractions 12 kg. of sulphate of ammonia per ton of coal. No particular attention was paid to the gas. The quantity recovered was about 6000 c.ft. per ton, and its composition makes it very suitable for heating purposes. The carbonization process produced about 20 gallons of oil tar. The catalyzation treatment gave 19 gallons of oil. The difference in the value can be best demonstrated by the results of the fractional distillation of both products:

—	Low-Temperature Carbonization.	Catalyzation.
Aviation spirit	*Nil*	5·3 gallons
Light oils	2 gallons	13·5 "
Tar oils	8·6 "	*Nil*
Pitch	8·8 "	0·5 gallons

These results undoubtedly prove that Prudhomme can convert almost the whole oil tar from low-temperature carbonization into light oils. The most remarkable fact is the large percentage of aviation spirit. Its specific gravity is 0·727! A fractional distillation carried out by one of the leading

analytical chemists in this country showed that 1·2 gallons of spirit, or 22 p.ct., could already be obtained at 50° C., about 3 gallons up to 70° C., and that the whole had been distilled over at about 100° C. This spirit can be used without further rectification as a motor spirit, though it would, however, have to be mixed with a spirit of higher boiling point such as "white spirit." A much better use of some of the lower fractions could be made as a solvent, which is one of the most valuable products of this particular series of hydrocarbons.

The 13·5 gallons of light oil contained a large percentage of motor spirit No. 3. The remaining fractions after 300° C. show a great viscosity, and should be very valuable as a lubricating oil. The residue is in the nature of a soft oil tar pitch soluble in benzole and suitable for varnish work.

FINANCIAL RESULTS.

The total sum obtainable for the products of the 20 gallons of oil tar would be approximately 7s. 3d., leaving aside the question of sulphate of ammonia. The products of the trials from catalyzation in the state as they were submitted for analysis could be estimated as to 1s. 6d. for the aviation spirit and as to 6d. for the light oil. It is, however, quite likely that both products would ultimately yield higher prices. There will be no difficulty in disposing of large quantities of these products. But even if one calculates the aviation spirit at only 1s. 3d. per gallon and the light oil at 6d., one would obtain 13s. 6d. per ton of coal treated by Prudhomme's process instead of 7s. 3d. from ordinary carbonization.

A hypothetical daily operation sheet, based upon a throughput of 350 tons per day will show the great advantages to be derived from Prudhomme's process. All the costs for carbonization plant and the other installations, the cost of labour, electricity, steam, &c., have been calculated from actual figures. The cost of the catalyzator is estimated, as no large plant is working yet. But in no one case will the additional costs be excessive, as for certain new items parts of the standard plant have to be eliminated.

—	Ordinary Carbonization Plant.	With Prudhomme's Process.
	£ s. d.	£ s. d.
Capital costs	92,000 0 0	103,000 0 0
Daily operating cost, including depreciation, &c.	292 3 3	296 17 3
Daily revenue	390 18 1	507 8 11
Profit per day	98 14 10	210 11 8
Profit per annum	30,000 0 0	63,000 0 0

The value of the daily bye-products are £147 19s. 7d. and £264 10s. 5d. respectively. It should also be borne in mind that the market in tar products, which form the main portion of the oil tar products by ordinary low-temperature carbonization, is rapidly becoming over-produced, which will make the sales of products from carbonization still more difficult. On the other hand, the consumption of motor spirit is daily increasing in this country. It amounts already to 800 million gallons per year. Furthermore, there is an import duty of 4d. per gallon, so that all motor spirit produced in this country could be easily disposed of.

The Prudhomme process as a commercial proposition is still in its infancy. A plant capable of treating 10 tons per day is in course of erection, and should soon be in working order. The experiences gained by many tests with the trial plant, the sound scientific basis, and the thorough manner in which it has been applied for practical use are a guarantee that the process can be adopted for commercial purposes. The progress of Prudhomme's invention should be closely watched by all collieries producing bituminous coal and by the owners of low-temperature carbonization processes who experience now great difficulty in showing a favourable balance-sheet.

Where the Gas Industry Stands in Research.

By W. C. BECKJORD, Vice-President and Engineer, American Light and Traction Company, Chicago.

[From an Address to the American Gas Association Convention, Oct. 16, 1929.]

Great progress has been made in the gas industry in the development of the gas stove and water heater and the central type of heating plant, and certainly the industry has every reason to feel proud of its present position in the domestic field. The modern gas range is a scientific piece of apparatus, and its heat control is as absolute and as positive as the electric. The modern storage water heater is an efficient piece of apparatus which operates year in and year out with little maintenance. The central type of heating plant is also highly developed, and is in use throughout the country. This growth has been accomplished by co-operation between the industry and the manufacturers, and great progress has been made in spite of the fact that there exists in the gas field no outstanding manufacturing combination similar to those in the electric field. No doubt this will be an advance of the future; and when it comes it will put the gas appliance manufacturing industry in the front rank of the industrial organizations of the country.

Considerable thought should be given to the necessity for research work in the matter of rates to encourage the new applications of gas to industry and for larger domestic use. For instance, instantaneous water heaters have been developed in the past which involve a high demand, thereby increasing the peak demands on the entire system. A new form of water heater has been designed which eliminates this maximum demand, thereby earning for this particular class of business a lower rate and, incidentally, widening the economic field of application for the water heater.

The development of equipment for house heating is becoming an active factor in the sales campaigns of many gas companies. Up to the present time this class of business has apparently not grown to the point where it is a serious factor in the peak load on manufactured gas distribution systems and plants, but it is rapidly becoming so. Inasmuch as it has many points in its favour and there is a wide public demand for it, it seems advisable to conduct research to see if the house heating business cannot be developed on an off-peak load by use of heat storage tanks, or in any event taken on at a profit. It may become a more serious peak load factor on the plant than on the distribution system, because in the severe winter weather the three-day peak must be considered. Water-heating is done in Switzerland by means of hydro-electric current at very low rates at off-peak times under thermostatic control, and it may well be that this could become an important consideration in building up the load factor of the gas companies and making the house heating load an off-peak one. It is suggested that considerable research work could be done on this, and no doubt some of the companies are already considering it.

SEARCH FOR THE TRUTH.

It takes peculiar qualities of mind to engage in research work. It involves a tremendous desire to search for the truth and to follow it no matter where it leads. There can be no predetermined ideas or blind faith in the traditions of the past; every process and every new idea must be subjected to a pitiless analysis based on the facts, and if the idea cannot measure up to this acid test, it must be discarded and investigation started along new lines. There can be no reservations whatever if research work is to accomplish its purpose. It will be found that when a given situation is canvassed to develop the facts already existing, more statements of things that are not so will be discovered than real facts. The world is full of mis-statements, perhaps because it is easier to make mis-statements than to investigate the facts; but the research man must be prepared to go all the way.

The organization of the American Gas Association Testing Laboratory at Cleveland has been one of the most important developments in the gas industry, and in this respect it has even gone ahead of the electric industry. Originally the Gas Association Testing Laboratory was founded with the express idea of testing apparatus which was to be sold and used by the public, but this idea has expanded into a broader treatment o. problems now under discussion, whereby they do research work on many problems of interest to the gas industry; particularly the mixed gas problem, applications and use of other gases, recovery of bye-products of the oil industry; and now they are engaged in a broad and comprehensive problem of pipe joint and corrosion research. The laboratory affords a proving ground, as it were, wherein all problems can be approached from an unbiased standpoint and without prejudice or preconceived ideas. Too often an operator engaged in operating a plant taking up research work is apt to try to prove some ideas or methods that are already generally used. A research man can take nothing for granted. His field is the world, and he must follow wherever the facts lead.

A great deal of valuable research work has been done by the Industrial Gas Committee, and some remarkable developments in brass melting have been forthcoming, particularly the use of the rotary kiln furnace.

In the Department of Engineering and Research in the University of Michigan, research work has been conducted on forging and decarbonization of steel. In collaboration with the

American Institute of Baking, research work on bread-baking has been done with great success. Considerable research work has been done on bright annealing, alundun refractory burner and heavy duty broiler, core baking, ceramics, house cooling, and many others.

There is a very definite programme for research now under way at the Cleveland Laboratory.

Two Problems.

Some time ago the industry submitted to Dr. Little, at Boston, two problems: First, that of providing the industry with a non-poisonous, non-asphyxiating gas, and secondly, that of finding a way of rendering this gas a more complete product, in the sense of being one which should require no admixture of primary air. This work has been carefully canvassed and discussed, and recommendation has been made that an appropriation of $50,000, extending over a three-year period, be made to cover cost of carrying out suggested studies, laboratory tests, and reports. This, of course, will involve consideration of the methanation of coal gas and water gas, which would have an exceedingly important bearing on the use of oil in gas manufacture. This one factor might entirely revolutionize modern gas manufacturing methods.

Studies are being made now as to increased pipe line capacity based upon high transmission pressure. The gas industry is fundamentally in a very strong position for generating and transmitting energy at low cost. The efficiency of the modern gas plant in producing gas from coal and oil is on the order of 75 p.ct., and in some cases even higher. This compares with the thermal efficiency of the modern electric generating station of something in the neighbourhood of 20 p.ct., or a ratio of 3 to 1. The ratio of investment cost based on 100 p.ct. load factor is very nearly as large, so that it would seem that there are tremendous opportunities involved in the long-distance transmission of energy in the form of gas and in the development of a gas-fired turbine. Discussion is now under way along the lines of increasing the transmission pressure up to 1500 lbs. and possibly higher.

The use of oxygen in continuous gas making processes and water gas machines is largely based upon the discovery of low cost methods for making oxygen. At the present cost it does not seem feasible to use oxygen in gas manufacturing processes, but it may be that better methods will be evolved which will make it economically possible.

The coke problem is one that has been with the gas industry for many years, and research in the production and utilization of this bye-product would be very valuable. For several years past a plan has been suggested whereby the Bureau of Mines of the United States Government would undertake a very thorough research on American coals involving consideration of their gas-making as well as coke-making qualities. So far, no appropriation has been secured from the Government to further these studies, but it is to be hoped that some progress will be made in the near future. Certainly, research on production, utilization, and sales of coke will be very valuable and is vital to the industry. It is recommended that careful consideration be given to this in any plan of research for the gas industry.

A manufacturer who is engaged in increasing business must, of necessity, be prepared to meet competition from other manufacturers in the same line, and to do this properly he must scrutinize his manufacturing costs with exceeding care. In many cases he can well afford to use a higher priced fuel for heating processes in order to speed up manufacture or to secure a better product; because in the last analysis a better product will always command a higher price if it can justify the added expenditure. In following the progress of the application of gas, the research man must become intimately acquainted with all the problems of the manufacturer whom the industry serves, and this applies to every branch of the industry.

Ignoring Precedent.

In view of what Henry Ford has accomplished in the automotive world with his announced policy of ignoring precedent, might it not be well for gas engineers sometimes to view their problems from the standpoint of one who knows nothing whatever of the details of the gas business, and, during that part of the working day which is devoted to planning for the future, give consideration to new methods of production, distribution, and utilization, which are not necessarily founded upon past precedents?

Research does not only involve gas manufacturing and distribution processes, but it should and must be applied to other branches of the industry as well. Research in its broadest scope will take up problems of accounting, office management, methods of handling customers, and public relations, and also methods of finances and planning for the future. Of course, some of these matters in the last analysis may resolve themselves to a matter of judgment, but certainly a great deal of progress can be made by applying the same fundamental principles to all lines of the gas business, as is being done in the research laboratory in development of new processes of manufacture, &c.

It must be remembered that the industry must function along the lines for which it was organized, and that while new ideas are desirable and essential, they must be put into effect carefully, so as not to jeopardize the financial condition of the industry. Some radical changes in the style of women's clothing, for instance, have absolutely wrecked some of the textile industries, and the same might be true of the gas industry where changes that are too radical are put into effect. Progress along these lines must be made slowly, and reason must be tempered with judgment. It must not be felt, merely because a new process has been discovered in the laboratory, which looks good on the surface, that necessarily the gas business must be completely revolutionized. Progress can be made slowly and effectively, and each year contribute its measure of improvement to the sum total of our progress.

In any particular discussion there usually can be as many reasons advanced on one side as on the other. Few propositions are so clearly defined that the reasons for going ahead are all in the affirmative. In the last analysis, most propositions must be decided on that judgment which is essentially based upon past experience, power of analysis, courage, and confidence in the future. It is difficult, if not impossible, to derive any formula by which any proposition can be tested and found correct or proven wrong.

Likewise, problems can never be solved by ignoring them. Each new development of the business should be followed through to its logical conclusion, if possible, as analyzed in the light of all other knowledge which we have obtained on the subject. If a conclusion is arrived at, a decision should be made, because progress depends upon decisions and not upon a policy of procrastination.

The Venturi Principle.

Some years ago the Bureau of Standards made a very complete investigation of the efficiency of gas burners utilizing the Venturi principle of air mixing. This is a subject that should be thoroughly investigated by means of exhaustive experiments by the gas companies, not only manufacturing appliance companies but operating companies as well, because with the class competition of the highly efficient electric ranges, it is necessary to secure a gas range that will give the highest rate of efficiency. In this connection, it might be stated that one of the large electric companies in this country has produced a new type of electric range utilizing the radiant heat principle, which is exceedingly efficient and can be sold at low cost. This is a factor that the gas industry should take cognizance of, and further concentrated research work on this subject is desirable.

Research should come to be considered not as a necessary evil but as an effective tool in the hands of the executive to determine the facts in so far as they may be determined on which future plans may be based. A research man can obtain the facts, but the executive must determine how they can be applied to the business in a way that will bring in net earnings, and also give better service to the public. Research will never displace courageous judgment, but it will help to prevent mistakes.

Closer Co-ordination.

It is suggested that there must be closer co-ordination in the efforts of the research man, the operating man, and the man in charge of the financial side of the industry. If these men can get together around the conference table and exchange ideas, each giving proper consideration to the problems of the other, certainly more definite forward progress can be made than if each group works out its problems along separate lines. Engineers and research men have perhaps ignored the questions of finance too much in considering their problems, and therefore they are apt to meet with disappointment when bringing a certain expenditure up for approval on finding that they have not given due thought to the economic and commercial factors. If these things were all thrashed out before, it would make for a more thorough understanding of the problems involved by all concerned, and undoubtedly effect a broader leadership. Certainly, it is far better to spend what little money is required for investigation in advance and develop the ideas on paper as far as may be, giving thorough consideration to cost, rather than to proceed blindly along on new construction, thereby possibly perpetuating mistakes and erecting monuments to incorrect principles.

One of the chief factors of the great progress in the electrical industry has been the romance connected with it, and by far the greater part of the present research is undoubtedly along the lines of radio application. It may be that there is no equivalent touch of romance in the gas industry, but no efforts should be spared to make progress in what there is. Refrigeration by means of gas-fired units is an amazing innovation, and it is arousing widespread interest among the general public. Romance or not, however, the economics of any given situation are bound to be considered, and in industrial application the cost of production is paramount. The necessity for meeting competitive situations has caused tremendous strides in thermostatically controlled gas apparatus already, and there is no question that more can and will be done along these lines.

It must be borne in mind that the industry must always be planning for the future, and, of course, this involves not only

expenditure of money both in engineering studies and research work, but also consideration of public policy. The time is past when the various departments can work as separate units. They must work as co-ordinated members of a group, and those in responsible charge of the gas industry must train men who have experience which will enable them to give proper consideration not only to the facts obtained by research, but to the financial aspect; and a broad and intelligent conception of public policy matters as well. It must produce men who have courage to face the future with confidence. Technical research is important, but courage and vision are perhaps more so. Any industry which keeps its house in order in a way which is bound to result from such a procedure cannot help but survive. It will readjust itself to new conditions as they occur, and it will always be in a position to develop new processes, not only of manufacture and distribution, but of utilization as well.

Meters for Mains.

[From the Bournemouth Gas Company's Co-Partnership Magazine.]

An interesting innovation has recently been introduced in connection with the Company's trunk gas mains at Bourne Valley and Poole in the form of the installation of disc meters for the purpose of continuously measuring the amount of gas passing through them.

Hitherto there has been no ready means of finding out the amount of gas passing through an individual trunk main, because the ordinary type of meter would be far too cumbersome and expensive to instal for this purpose, having regard to the very wide variations in the output of gas from the time of minimum demand in the early hours of the morning to the time of maximum load when the Sunday dinners are being cooked.

As a matter of fact, the total demand for gas on a cold Sunday in winter varies from over 1,000,000 c.ft. of gas from twelve to one o'clock to a minimum of about 70,000 c.ft. between 3 and 4 a.m. From these figures it will be readily seen how impossible it would be to instal a station meter with a capacity of a million cubic feet of gas per hour for the purpose of indicating the Company's hourly output of gas.

For this reason, though the Company have a number of large trunk mains stretching out for miles towards the other limits of their district, there was no means of ascertaining whether all these mains were taking their fair share of the work of supplying gas to the tens of thousands of consumers, or whether some were doing more than their share and others doing little or nothing. Recently, however, attention was called to a new type of meter suitable for measuring large quantities of gas easily and cheaply in the form of the "Arkon" disc meter. This type of meter has the following advantages:

(1) Its initial cost and maintenance is very low compared with other large meters, and it is independent of the quality to be measured.

(2) The indicator or recording portion can be placed in any suitable position away from the main to which it is connected by ¾-in. dia. pipes.

(3) The meter can be readily altered at any time to record a larger or smaller volume; the size of the main being the ultimate limit to the maximum amount measured.

(4) Clean or crude gas can be measured without the latter having any bad effect on the instrument. If crude gas is measured, a correction is then made for the amount of impurities in this gas.

(5) The instrument can measure the gas at any predetermined temperature.

(6) The accuracy of the meter is guaranteed under specified conditions to *plus* or *minus* 2 p.ct.

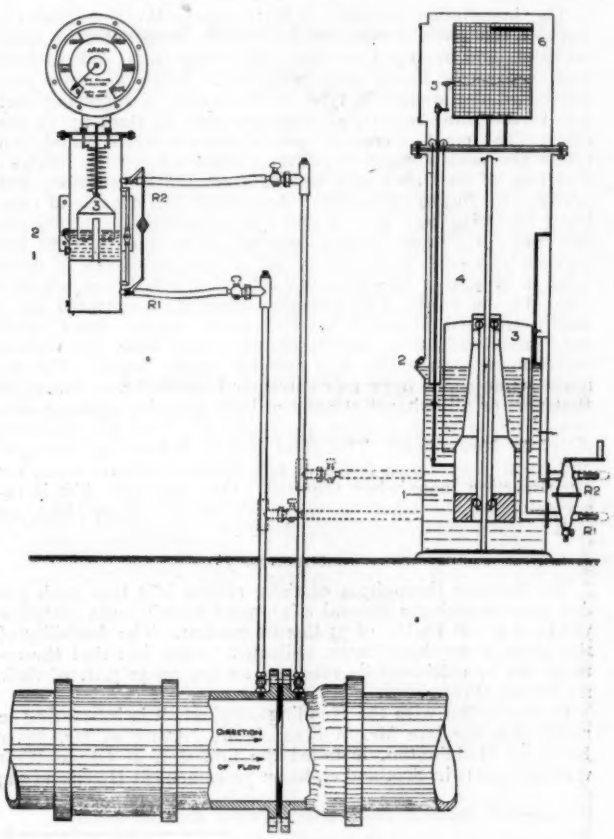
The principle of the instrument depends on the flow of gas through a pipe banking up before any obstacle, like water in a stream. The resistance of the obstacle causes an increase of pressure in front of it and a fall of pressure behind it. To obtain this pressure difference, a special metal disc having a predetermined orifice is fixed between two flanges in the main, as shown in the illustration. The edge of the orifice is chamfered to present a sharp edge to the upstream gas.

To obtain accurate results, there must be no eddies or turns in the flow; and, to avoid them, it is stipulated that there must be a length of main equal to eight diameters of the size of the main before and after the disc. In this way a difference of pressure arises which depends on the velocity of the stream of gas.

The illustration shows (1) a gas volume indicator and (2) a gas volume recorder. The former indicates the gas actually passing in cubic feet per hour at any time, but will not give the total amount passed per 24 hours, unless, of course, the volume is a constant one. The recorder gives the variation in flow of gas at any time, and from the chart can therefore be calculated the gas passed every 24 hours. It will be appreciated that this is a very valuable asset to a foreman responsible for the make of gas from any bench of retorts, as any alteration made in the working is immediately recorded, and the result in gas made noted.

In each case the gas pressure from both sides of the disc in the main is conveyed through ¾-in. dia. pipes to the two cocks on the instrument, which can be placed well away from the main and in any desired position.

The tank (1) is first filled with water to the overflow (2), and carries a specially-designed float (3). The pipe from the "upstream" or high-pressure side of the disc is connected to R.1 to the underside of the float, and the pipe from the down stream or low-pressure side of the disc is connected to R.2 to



the air space above the float. The two pressures, therefore, cause the float to take up a definite position, which is communicated by the pen rod (4) and the pen (5) to the chart (6).

As the differential pressure varies as the square of the velocity of the gas passing the disc, it is evident that, if an ordinary bell float is used, unequal chart divisions will be obtained; and to overcome this a special bell is designed to change the velocity squared value into one of a straight line value. All the instruments are calculated to record the gas at N.T.P., or other conditions that may be required.

The value of having such meters installed was shown immediately they were brought into use, as the first records indicated that very little gas was passing through the low-pressure trunk main from Bourne Valley to Bournemouth. This was obviously due to the fact that gas was being passed so freely through the district governors served by the high-pressure mains that it was able to back up at the end of the low-pressure main, and so prevent gas passing through it.

Again it was found that the high-pressure main to Broadstone was passing far more gas than was anticipated, and obviously the gas was passing through the district governors and supplying Hackford Park and Longfleet, which should have been supplied by means of the low-pressure mains from Pitwines except at times of maximum draught.

By slightly decreasing the pressure thrown by the district governors, it was possible to ensure that the low-pressure mains took up their share of the load and so relieved the boosting mains, with a consequent saving of fuel.

Another Example of Verticals for Small Works.

From "West's Gas."

There may be seen a curious inscription in front of one of the old houses in Haddington. It is the sign of a candle-maker, and reads: I T IIIIII I D 1597. Interpreted it means: "In tallow candles I deal 1597."

Since the days of this old candle-maker Haddington must have witnessed many changes in lighting service, the most recent of which was set on foot when the Directors of the Haddington Gas Company, on the advice of Mr. L. Hislop, Consulting Engineer, decided to equip their works with a plant representing the latest advance in the efficient carbonization of coal. The contract for this work was placed with Messrs. West's Gas Improvement Company, Manchester, at the early part of last year, and gas-making was commenced in October, exactly five months after commencement of erection.

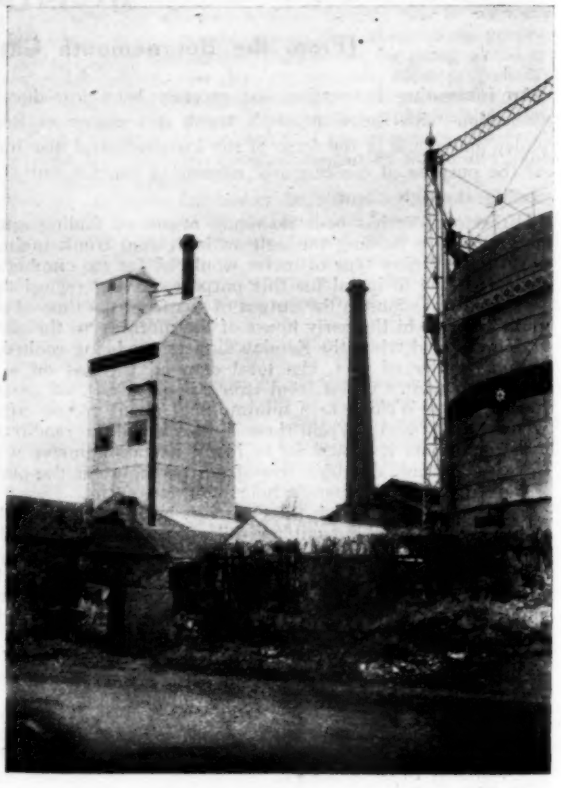
CARBONIZING PLANT.

The installation consists of three Glover-West vertical retorts of the 40-in. "New Model," 25 ft. long, built in silica material, and arranged so that each retort is an independent unit, separately heated and controlled. There are two producers, of the step-grate type, each capable of supplying fuel gas to the three retorts, so that one acts as stand-by to the other. The plant is erected upon a mass concrete foundation inside the coal store in a position which allows the efficient handling of coal and coke to and from the installation, and provides for future extensions. An electric lift, capable of raising a load of 20 cwt. at a speed of 70 ft. per minute, transports the coal, in bottom-opening barrows, from the store to the overhead storage bunkers. Coke to the producers is dealt with in a similar manner, the coke for sale being wheeled away to the yard. The extractor gearing is operated by a totally enclosed Marshall vertical steam engine fitted with automatic lubrication, and is placed, along with the electric switchboard for the lift, in a suitable engine house. The exhaust-steam pipes from this extractor engine are so arranged that part or all exhaust steam can blow into the producer ash-pan to soften any formation of clinker, or, when not required, direct to atmosphere. The plant is well lighted by both gas and electricity; a plug has been left at each platform stage for an inspection lamp when required. One man per shift is responsible for the whole of the work on the retort plant, as well as the usual works routine duties.

FLEXIBILITY.

The average throughput of these retorts is 5 tons each per day when working a general mixture of Scotch coals, giving a yield, at 475 B.Th.U., of 75 therms per ton. The flexibility of the plant is worthy of note, indicated by the fact that the retorts can be efficiently operated on as low as 40 p.ct. of their maximum throughput.

In connection with the Haddington plant, it is interesting to recall that the late Mr. William Blair, brother of Mr. Peter Blair, of Haddington, installed the first unit of Glover-West vertical retorts in Scotland eighteen years ago, at Helensburgh; and Mr. Blair, jun., who is also at Haddington, became well acquainted with the Glover-West system during the eight years he was at Santos, Brazil, under the management of Mr. Bernard F. Browne.



AUXILIARY PLANT.

In addition to the new retorts, Mr. Hislop's report also included for the provision of new purifiers and exhauster, and an additional lift on one of the existing gasholders, all of which work is now completed.

The Haddington Gas Company was formed in 1834, and records show that gas lighting was first introduced into the town 93 years ago. The present annual make is 24 million c.ft., which load is almost entirely a domestic one.

C. A. P.

Is a Pension of 10s. Sufficient on Retirement at Sixty-Five?

The Hinckley Gas Committee made a recommendation to the Urban Council, on Jan. 1, that all the Committee's workmen should retire at the age of sixty-five unless the Committee, dealing with each case on its merits, determine otherwise.

Mr. T. BROMLEY, the only Labour member on the Council, considered the proposal uncalled for. A pension of 10s. a week, he said, was insufficient for a man to retire upon. It would not cover house rent and coal, and the men would have to receive charity or enter the Poor Law institution.

Mr. J. BENNETT, Chairman of the Gas Committee, said they were not proposing to dismiss men at the age of sixty-five, but at that age to review each case. They felt that a man of sixty-five was not of the same value as a man of forty or forty-five, and it was hardly fair to pay a man of sixty-five the same wage as the younger men.

Mr. BROMLEY said he had not heard of any private firm in the district taking advantage of the pensions to such an extent as the Gas Committee proposed to do.

The resolution was carried, Mr. Bromley being the only dissentient.

Mr. Ben Fletcher, of Skipton, retired at the end of the year, at the age of 69, after 36 years' service at the Skipton Urban District Council Gas-Works; and has been presented with a handsome oak timepiece by his colleagues.

Market Harborough Gas Department.

The ninth annual report on the working of the Market Harborough Gas Department for the year ended March 31, 1929, shows that the total expenditure has been £961, of which the major portion, £735, was for new mains and services. Last year the expenditure was £823. The principal repaid on loans during the year was £2871, compared with £2814 last year, making a total repayment to March 31, 1929, of £38,343. The balance of loans now outstanding is £41,576. The gross profit for the year (£6991) is equal to 20s. 10·05d. per ton of coal carbonized, and to 17·67d. per 1000 c.ft. of gas sold. During the year 6710 tons of coal were carbonized—an increase of 404 tons over the previous twelve months. The make of gas per ton was 16,068 c.ft., which, having a calorific value of 484 B.Th.U. per c.ft., gave a thermal yield of 77·8 therms per ton. The total make of gas was 107,828,000 c.ft.—an increase over the previous year of 2,787,100 c.ft. The sales of gas per ordinary meter show a decrease of 1,852,700 c.ft. and prepayment meters an increase of 3,139,100 c.ft. The receipts from coke and tar were £2900 and £2698 respectively, while sulphate of ammonia continued to show a loss; this year of £107. The net receipts were £5491, as compared with £5478 the previous year. The number of meters in use is 2638, of which 956 are ordinary and 1682 prepayment. The number of cookers on the district and owned by the Department is 1775, and of gas fires 441. During the year 63 high-grade cookers have been sold on terms of hire purchase and 17 for cash, making the total sales 247 and 74 respectively during the past four years.

Register of Patents.

Waterless Gasholders.—No. 304,765.

MASCHINENFABRIK AUGSBURG-NURNBERG A.G., of Nürnberg.

No. 713; Jan. 8, 1929. Convention date, Jan. 26, 1928.

This invention consists in separating the sheet-metal skin of the gasholder casing structurally from the supporting framework as far as possible, so that the sheet-metal skin has to support substantially only the internal gaseous pressure, while the framework is intended for taking up the external forces arising from wind pressure, intrinsic weight, and so forth, and forms in itself a stable structure into which the cylindrical sheet-metal skin is merely fitted. This construction, by which the sheet-metal skin is freed from all constructional forces, permits of the employment of particularly thin walls, and on the other hand of the formation of a clear framed structure which is easy to inspect and which can also be carried out with less expenditure of material than hitherto.

It is possible further to simplify the construction by not making every side wall of the periphery of the holder in the manner just indicated, but only a portion thereof—for instance, every other bay. The intervening bays are then only equipped with simple diagonal stays and the like to enable transverse forces to be transmitted between the remaining bays.

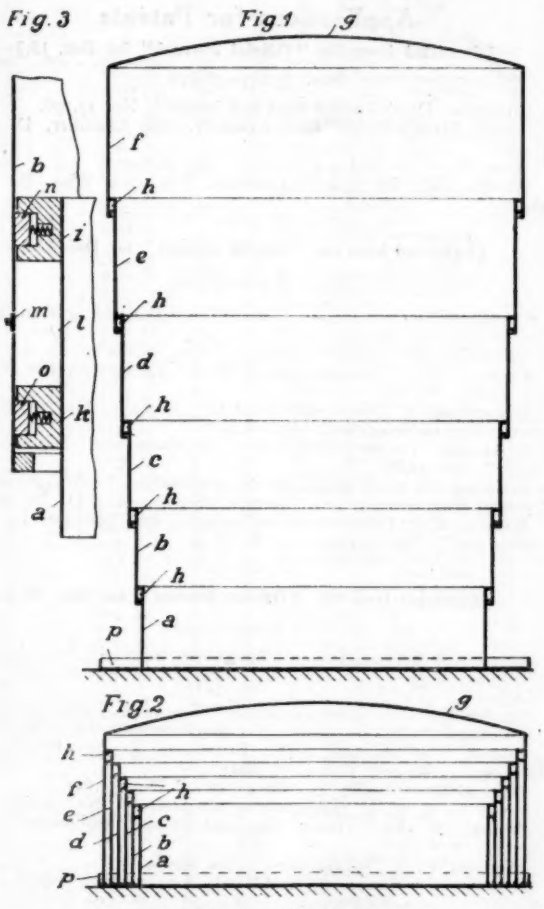
In many cases it may be advantageous to provide a yielding connection between the casing and the framework. Resilient connecting pieces are then provided, which are distributed over the casing, as required.

Gasholders.—No. 316,543.

MASCHINENFABRIK AUGSBURG-NURNBERG A.G., of Nürnberg.

No. 12,564; April 23, 1929. Convention date, June 30, 1928.

According to this invention, the upper sections of the shell are of greater diameter than those below them, so that the top section is the one of greatest diameter and carries the holder cover; the sliding seal being at the top outside edge of each inner shell section, so that the inner surfaces of the shell sections slide past the seal.



Telescopic Gasholder without Water Tank.

The combination of these two features provides the advantage that the insides of the wads, along which the seal slides, remain uninfluenced by wind and weather. It is also impossible for rain or dirt to penetrate from above, as the annular gaps between the shell sections are downwardly directed and are protected by the outer shell sections. The sliding surfaces thus always remain clean, their coating of lubricants or sealing media will not be damaged, and the consumption of these materials remains low. One of the main advantages of this arrangement is that the internal surfaces of the entire holder, which during operation are inaccessible, are always covered with a layer of grease, and are thus protected from corrosion. As the external surface of the metal skin is always accessible, the conditions for keeping the whole of the wall in proper condition are as favourable as possible.

Fig. 1 shows a filled holder of the new construction in vertical cross-section, and fig. 2 the same holder empty. Fig. 3 is a section through a seal, in order to show how the sliding seal required for this construction may be constructed.

Bunkers of Retort Chargers.—No. 321,765.

GREEN, R. W., of Bath, and ALDRIDGE, J. G. W., of Victoria Street, S.W. 1.

No. 26,981; Sept. 20, 1928.

This invention relates to means for operating automatically the doors of coal hoppers of traversing charging machines for gas retorts.

Two or more bunkers are provided, each with delivery doors arranged in line over the path of travel of the receiving hopper of the charging machine, and the doors of the different bunkers are arranged to be opened by separate strikers on the charging machine, while means are provided whereby the strikers may be put into and out of operative position at will. The closing of the delivery chutes may be effected by a further striker capable of operating any of the doors.

Ammonia Recovery.—No. 322,049.

TYRER, D., of Norton-on-Tees, and IMPERIAL CHEMICAL INDUSTRIES, LTD., of Westminster, S.W. 1.

No. 29,545; Oct. 13, 1928.

The hot gas issuing from the hydraulic main, and containing tar vapour, benzole, and ammonia, is passed into coolers in which an aqueous liquor containing tar and a portion of the ammonia is condensed. The condensate is returned to the hydraulic main, where ammonia is distilled from it and joins the gas stream, so that the gas passing through the cooler becomes enriched in ammonia. On leaving the cooler, the cold gas is led through a scrubber in contact with liquor coming from a settler which is led directly from the hydraulic main or from a stripping (de-ammoniating) apparatus. All the ammonia is thus removed from the gas without the use of fresh water, and a 3 to 5 p.ct. liquor is obtained, instead of the usual 1·5 to 2 p.ct. liquor. The "fixed" ammonia salts which are usually present are contained in the condensed liquor and pass unchanged in the stripped or de-ammoniated liquor to the scrubbers.

Suspension Device for Gas Lamp Bowls. No. 322,061.

WHITEHOUSE, W., & CO., LTD., and PINNELL, C. H., both of Birmingham.

No. 31,172; Oct. 27, 1928.

A divided collar is provided, and means whereby it is circumferentially contractable so that the collar may be made to grip the pipe effectively. Each part of the collar is of semi-circular form, and the two parts may be hinged together or may be connected by a hinged link. The collar is circumferentially contractable by providing one part with a hinged or other pin which can be moved into a tangential position and which is provided with a nut for engaging the other part so as to draw the two parts together. The collar is provided with radially projecting hooks for receiving the upper ends of suspension chains.

Promoting Fuel Combustion in Domestic Grates. No. 322,086.

HEPBURN, R. H., of Birmingham.

No. 34,479; Nov. 23, 1928.

Compressed air from a fan, blower, or other means is passed into a detachable apparatus adapted to be suitably supported in front of the grate, and comprising one or more nozzles for directing the air into the fuel.

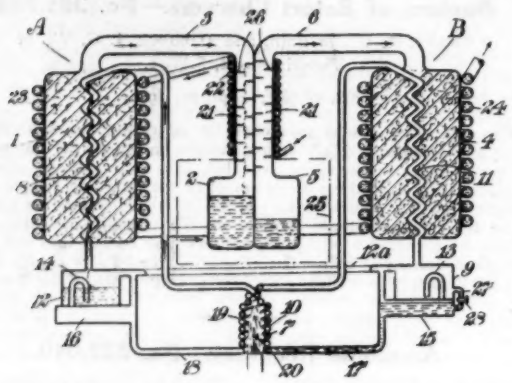
Gas-Operated Refrigerator.—No. 322,226.

MASTERMAN, C. A., of Oxshott, and the GAS LIGHT AND COKE COMPANY, of Horseferry Road, Westminster, S.W. 1.

No. 25,159; Sept. 1, 1928. No. 19,509; June 25, 1929.

This invention relates to refrigerating systems. It involves the employment of the known type of reversing refrigerating unit in which cold is produced by the rapid evaporation of a liquid refrigerant, the vapour of which is absorbed by adsorbent material. The liquid refrigerant is contained in an evaporating chamber, and the adsorbent in a second chamber. The two chambers are connected by a conduit and comprise a closed circuit for the vapour. The object of the invention is to provide an improved automatic and continuously operating refrigerating apparatus of the reversing adsorption type. The liquid refrigerant may be anhydrous ammonia, or an organic solvent such as butane, trimethylamine, and the like.

The accompanying drawing illustrates diagrammatically one form of refrigerating apparatus according to the invention. The apparatus comprises two exactly similar units A, B, each comprising an adsorber packed with active charcoal, an evaporator containing anhydrous ammonia in liquid form, and a vapour conduit connecting the adsorber with the evaporator, so that the two are in hermetically sealed communication. The adsorber, evaporator, and conduit of unit A are marked 1, 2, and 3 respectively, and those of unit B 4, 5, and 6.



Gas-Operated Refrigerator.

Each unit includes a boiler in the form of a spiral coil, for generating steam for heating the adsorbent material and thereby driving the adsorbed vapour back into the evaporator, a steam coil situated within the adsorber and communicating with the boiler, and a water reservoir for the boiler, which reservoir is situated beneath the adsorber of the opposite unit and receives condensed water from the steam coil within the adsorber. The boiler, steam coil, and reservoir of unit A are marked 7, 8, and 9 respectively, and those of unit B, 10, 11, and 12.

The reservoirs 9 and 12 are provided with syphon-feed outlets 13, 14. These outlets lead into auxiliary reservoirs 15, 16, which are connected respectively to the boiler coils 7, 10 by conduits 17, 18. The reservoirs 15, 16 are of somewhat smaller capacity than the main reservoirs 9, 12. The reservoirs 9, 12 are interconnected by a pressure-equalizing pipe 12^a. The boiler coils 7, 10 are intercalated and together form a cone-shaped enclosure 19 within which a gas flame 20 burns.

The action of the apparatus is as follows: While the ammonia in evaporator 5 is being vaporized and the vapour therefrom is being adsorbed in 4, adsorber 1 has heat imparted to it from steam condensing within the coil 8, and the ammonia vapour being driven out from adsorber 1 is passing back to evaporator 2, where it re-collects in liquid form. On its way to evaporator 2 the vapour passes through the vertical portion 21 of the conduit 3, and in this portion of the conduit it is cooled and its condensation is promoted. As soon as the adsorbent material in 4 has become saturated with ammonia vapour, the action of the apparatus is reversed, and adsorber 4 becomes heated and adsorber 1 commences to take in vapour. The whole operation of the apparatus, including the reversal of action, is automatic, the quantity of boiler-water in the two units, and the rate of heat transferred to it from the flame 20, being suitably proportioned.

The portion 21 of the conduit 3 is cooled by water circulating in the coil 22 surrounding the portions 21 of the conduits 3, 6. This cooling water, after circulating through the coil 22, passes to a second coil 23 surrounding adsorber 1. From this coil it passes on to a third coil 24 surrounding adsorber 4, and thence away.

The evaporators 2, 5 are, of course, located within the chamber 25 to be refrigerated, and the portions 21 of the conduits 3, 6 are located outside. The portions 21 of the conduits 3, 6 are adjacent one another, as shown, so as to be in heat-interchange relationship, and they are fitted internally with horizontal baffles 26 which serve further to promote condensation of the vapour passing to the evaporators.

The syphons 13, 14 operate to empty the reservoirs faster than the reservoirs fill and their dimensions are determined accordingly. One of the reservoirs—say the reservoir 9—is preferably provided with an additional outlet 27 leading to the auxiliary reservoir 15 and controlled by a stop cock 28. This additional outlet is to facilitate the operation of starting of the apparatus. The closed system contains nitrogen.

Igniting Gas Burners.—No. 322,310.

WELLS, J., and BURTON, M. G., both of Bilston.

No. 32,970; July 13, 1929.

This invention has reference to gas-burner lighting apparatus of the type in which the opening movement of the gas tap or cock is utilized for automatic ignition of the gas through the medium of a friction-wheel sparking device operating under control of intermediate spring-pressed connections to the tap or cock.

Gas Taps.—No. 322,609.

STOVES, LTD., and RICHARDSON, W. H., both of Liverpool.

No. 32,140; Nov. 5, 1928.

This invention relates to taps, and particularly to means for locking the tap or tap handle in its closed or open position.

A tap having a handle which is rotatable about an axis perpendicular to the axis of the rotatable cock member is provided in which a stop or abutment, projecting from the shell at a point situated away from the axis of the rotatable cock member and between the limiting positions of the axis of rotation of the handle, is so disposed relatively to the rotatable handle that when the cock is in both the fully open and the fully closed positions one of two corners formed by the intersection of one side of the handle and a shank extending therefrom is engaged by the abutment when the handle is rotated into a plane perpendicular to the axis of the cock.

Gas Heating Stove.—No. 322,719.

SCHOENFELD, J., of Alameda, California.

No. 13,400; April 30, 1929.

This invention relates to a heater which will serve both as a radiation and as an air circulating heater.

The objects are to simplify the construction and operation of gas heaters; so to construct a heater that all products of combustion may be thoroughly vented; to provide a glow section consisting of a thin section of metal which may be heated to a glowing temperature by the burner; to provide a reflector adapted to co-operate therewith, whereby both the heat and light rays radiating therefrom may be projected into the room; and, further, to provide means whereby air may be freely circulated through the heater, and heated, and directed into the room.

Applications for Patents.

[Extracted from the "Official Journal" for Dec. 18.]

Nos. 37,643—38,410.

CHANDLER, D.—"Incandescent gas lamps." No. 37,776.
SOUTH METROPOLITAN GAS COMPANY.—See Chandler, D. No. 37,776.
WEST, E.—"Vertical gas retorts." No. 38,109.
WEST'S GAS IMPROVEMENT COMPANY, LTD.—See West, E. No. 38,109.

[Extracted from the "Official Journal" for Dec. 27.]

Nos. 38,411—39,195.

CAMBRIDGE INSTRUMENT CO., LTD.—"Apparatus for gas analysis." No. 38,511.
CHANDLER, D.—"Tinmen's stoves." No. 39,102.
COLLIN & CO.—"Gas reversing device for regenerative coke ovens." No. 39,052.
HORSTMANN, A. (HORSTMANN GEAR CO., LTD.).—"Gas controllers, electric time-switches, &c." No. 38,411.
NAAMLOOZE VENNOOTSCHAP SILICA EN OVENBOUW MIJ.—"Coke ovens." No. 38,821.
ROBINSON, B. A.—"Apparatus for gas analysis." No. 38,511.
SOUTH METROPOLITAN GAS COMPANY.—See Chandler, D. No. 39,102.
WILSON, A.—"Device to collect moisture, &c., from pipe line conveying gas." No. 39,135.

[Extracted from the "Official Journal" for Dec. 31.]

Nos. 39,196—39,927.

BABCOCK & WILCOX, LTD.—"Water-tube boilers." No. 39,850.
BECKER, A. C.—"Gas piping for supply of combustible gas." No. 39,894.
BURTON FOUNDRY COMPANY, LTD.—"Gas ovens." No. 39,707.
CAMPBELL, D. F.—See Burton Foundry Company, Ltd. No. 39,707.
COWAN (GAS METERS), LTD., PARKINSON &.—See Parkinson & Cowan (Gas Meters), Ltd. No. 39,241.
DAY, A. H.—"Baffle cowl for geysers." No. 39,652.
FORD, G. R. H.—"Gas-producing apparatus." No. 39,912.
HAGGIS, M. A.—"Gas grilling and heating appliances." No. 39,536.
MARCONI, C.—"Gas turbines." No. 39,484.
PARKINSON & COWAN (GAS METERS), LTD.—"Gas meters." No. 39,241.
POOLE, D. C. E.—"Gas meters." No. 39,555.
THORP, F.—See Parkinson & Cowan (Gas Meters), Ltd. No. 39,241.
WILSON, J. H.—"Gas meter diaphragms." No. 39,554.
WILSON, J. H.—See Poole, D. C. E. No. 39,555.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Jan. 8.	Rise or Fall on Week.	Transactions Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 15	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	71—74	..	..
1,551,868	,,	Sept. 26	7⅞	7⅞	Alliance & Dublin Ord.	93—96	..	93½—95½
374,000	,,	July 11	4	4	Do. 4 p.c. Deb.	62—65	..	..
522,655	,,	Aug. 29	7	7	Barnet Ord. 7 p.c.	112—115	..	113½
300,000	1	Oct. 24	1/4⅛	1/4⅛	Bombay, Ltd.	16/- 18/-	..	..
172,500	10	Aug. 29	8½	9	Bournemouth 5 p.c.	12⅞—13⅛	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12⅛—12⅞	..	
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10½—11	..	..
50,000	Stk.	Dec. 19	3	3	Do. 3 p.c. Deb.	53—56*	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	71—74*	..	..
357,900	,,	Aug. 29	7½	7½	Brighton & Hove 6 p.c. Con	113—116	..	..
871,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	100—103	..	..
1,287,500	,,	July 25	5	5	Bristol 5 p.c. max.	87—89a	..	..
855,000	,,	Sept. 12	7½	7	British Ord.	112—117	—1	112
100,000	,,	Dec. 19	7	7	Do. 7 p.c. Pref.	118—114*	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69—71*	..	..
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	92—95*	..	..
140.000	,,	June 27	5	5	Cambridge 5 p.c. Deb.	90—98	..	..
100,000	10	Dec. 5	8	6	Cape Town, Ltd.	8½—9½	..	9
100.000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb.	69—74*	..	..
626,860	,,	July 25	6	6	Cardiff Con. Ord.	98—101	..	..
237 860	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
157,150	,,	Aug. 15	6½	5	Chester 5 p.c Ord.	87—92b	..	..
98,986	1	Oct. 10	†2/-	†2/-	Colombo, Ltd. Ord.	34/—36/-	..	..
24 495	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	19/—21/-	..	..
375,402	1	Oct. 10	1/9⅜	1/9⅜	Colonial Gas Assn. Ld. Ord.	23/6—25/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	..
2.073.280	Stk.	July 25	7	5	Commercial Ord.	90—95	..	91 92
475,000	,,	Dec. 19	3	3	Do. 3 p.c. Deb.	54—57*	..	55½
787,560	,,	Aug. 15	7	7	Croydon sliding scale.	104—107	..	..
403,100	,,	,,	5	5	Do. max. div.	80—85	..	..
542 270	,,	Aug. 29	10	7	Derby Con.	118—121e	..	..
55,000	,,	Dec. 19	4	4	Do. Deb.	67—70e*	..	..
209.000	,,	Aug. 29	5	5	East Hull Ord. 5 p.c.	73—75	..	..
1,002,180	10	Sept. 12	†7	†4	European, Ltd.	12½—14½	..	12⅝—13¼
18,708,480	Stk.	July 25	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	17/9—18/3f	..	17/10½—18/3
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60—62	..	..
4,157 020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	73—76	..	75
5,602,620	,,	Dec. 19	3	3	Do. 3 p.c. Con. Deb.	56—58*	..	57⅞
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97—100*	..	97½—98½
82.500	,,	Aug. 29	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	77—82	..	..
70 000	10	Oct. 10	†10	†10	Hongkong & China, Ltd.	13½—14½	..	..
213,200	Stk.	Aug. 29	6	6½	Hornsey Con. 3½ p.c.	84—87	..	..
1.976,000	,,	Nov. 21	20	10	Imperial Continental Cap.	330—350	..	329—335
228,130	,,	Aug. 15	3½	3½	Do. 3½ p.c. Red. Deb.	71—76	..	..
235,242	,,	Aug. 15	7½	8	Lea Bridge 5 p.c. Ord.	115—118	..	..
2,145,907	,,	Aug. 15	6½	6	Liverpool 5 p.c. Ord.	91—92b	..	..
600,000	,,	Sept. 26	7	7	Do. 7 p.c. Red Pref.	100½—102½b	..	..
165,736	,,	Aug. 29	8	9	Maidstone 5 p.c. Cap.	122—127	..	..
63,480	,,	Dec. 19	3	3	Do. 3 p.c. Deb.	52—55*	..	..
75,000	5	Dec. 5	†10	†10	Malta & Mediterranean	5½—6	..	..
392,000	—	Oct. 1	5½	5½	Metrop'itan (of Melbourne) 5½ p.c. Red. Deb.	92—95	..	..
541,920	Stk.	Nov. 21	†9	†6	Montevideo, Ltd.	103—106	..	..
2,061,315	,,	July 25	5⅝	5	Newcastle & Gateshead Con.	16/3—16/9df	..	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	71⅞—72⅞d	..	..
691,705	,,	Dec. 19	3½	3½	Do. 3½ p.c. Deb.	65½—66½a*	..	..
131.780	,,	Aug. 29	7/1/9	7s	North Middlesex 6 p.c. Con.	112—117	..	..
396,160	,,	Aug. 15	5	5	Northampton 5 p.c. max.	76—79	..	..
300,000	,,	Nov. 21	7	9	Oriental, Ltd.	108—113	..	..
60,000	5	13 My., '15	—	—	Ottoman	0—¼	..	..
205,162	Stk.	June 27	8	8	Plym'th & Stonehouse 5 p.c.	110 113	..	..
424,416	,,	Aug. 29	8½	8	Portsm'th Con. Stk. 4 p.c. Std	113—118	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	80—83	..	..
2 334,464	1	June 27	—	15	Primitiva Ord.	26/—29/-	..	27/3
244,500	100	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	91—94*	..	..
695,000	Stk.	July 25	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,345	,,	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	77—80*	..	..
150,000	10	Sept. 26	6	6	San Paulo 6 p.c. Pref.	8½—9	..	..
1 736 968	Stk.	Aug. 29	6⅔	6½	Sheffield Cons.	104—106e	..	..
95,000	,,	July 11	4	4	Do. 4 p.c. Deb.	75—77e	..	..
90 000	10	June 13	‡4	‡4	South African	4—6	..	..
6,603 895	Stk.	July 26	7½	5	South Met. Ord.	99—101	..	99½—100½
500,000	,,	,,	6	6	Do. 6 p.c Irred. Pf.	106—109	..	..
1,895 445	,,	July 11	3	3	Do. 3 p.c. Deb.	54—57	..	..
734,000	,,	Sept. 12	6½	6½	Do. 6½ p.c. Red. Db.	98—100	..	..
91,500	,,	Aug. 15	8½	8½	South Shields Con.	109—111d	..	..
1,543,795	,,	July 25	6⅔	6⅔	South Suburban Ord. 5 p.c.	101—104	..	102½
468,837	,,	Dec. 19	5	5	Do. 5 p.c. Deb.	92—95*	..	..
647,740	,,	Aug. 15	5	5	Southampton Ord. 5 p.c. max.	77—80	..	78—78½
121,275	,,	Dec. 19	4	4	Do. 4 p.c. Deb.	68—71*	..	..
179,014	,,	July 25	8	8	Sutton Ord.	116—119	..	..
67,828	,,	June 27	5	5	Do. 5 p.c. Deb.	90—93	..	91½
250,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
250,000	,,	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	97—99*	..	..
1,042,275	,,	Aug. 15	6⅔	6⅔	Tottenham District Ord.	101—106	..	..
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	Dec. 5	4	4	Do. 4 p.c. Deb.	72—75*	..	..
142,380	10	30 Dec., '12	—	—	Tuscan, Ltd.	1⅞—2¼	..	..
85,701	Stk.	Sept. 26	6	6	Do. 6 p.c. Red. Deb.	70—75	..	..
249,094	,,	Aug. 29	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	97—102	..	..
88,336	,,	,,	5	5	Do. 5 p.c. pref.	85—90	..	..
80,000	,,	July 11	9	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	135—140	..	..
275,636	,,	,,	7⅛	7⅛	Do. B 3½ p.c.	112—117	..	..
432,545	,,	,,	6⅞	6⅞	Do. C and New	95—100	..	98½—98⅞
312,000	,,	,,	7½	7½	Do. Wimbledon 5 p.c.	105—110	..	..
98,000	,,	,,	7⅜	7⅜	Do. Epsom 5 p.c.	113—118	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	87—92	..	..
88,416	,,	Dec. 19	3	3	Do. 3 p.c. Deb.	53—56*	..	..
284,743	,,	,,	4	4	Do. 4 p.c. Deb.	72—75*	..	..
257,500	,,	,,	5	5	Do. 5 p.c. Deb.	91—95*	..	..

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To receive the Directors' Report and the Accounts of the Company for the Year ended Dec. 31, 1929.
To declare a Dividend for the Half-Year ended Dec. 31, 1929.
To elect Directors and an Auditor in the place of those retiring.
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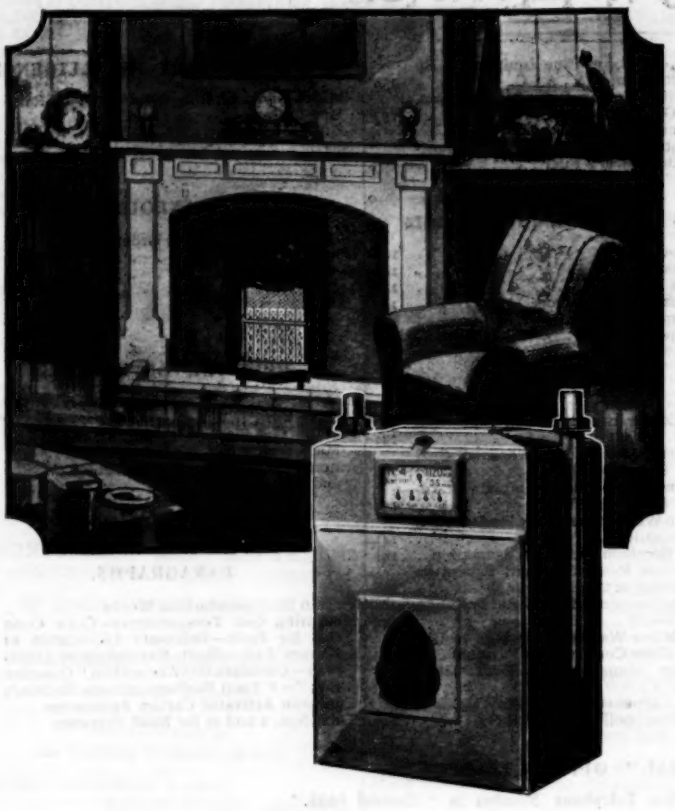

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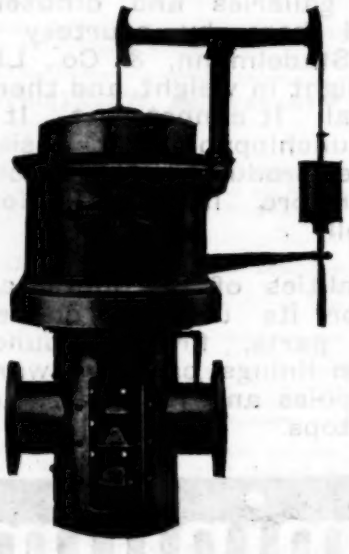

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